INSTRUCTION MANUAL

FREQUENCY SELECTIVE VOLTMETER

MODEL 126B

AMCC SOURCE DATA
PROPERTY OF U. S. GOV'T.

PHILCO

Ford

PHILCO-FORD CORPORATION
Sierra Electronic Operation
Menlo Park, Calif. • 94025

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FREQUENCY SELECTIVE VOLTMETER MODEL 126B

756-880

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SIERRA ELECTRONIC DIV.

OF

PHILCO

A SUBSIDIARY OF *Ford Motor Company*

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MANUAL CHANGES

In the Model 126B serial numbers 331-430 a wired Local Oscillator assembly instead of a printed circuit board assembly is used. Electrical operation of the two assemblies is identical. Serial numbers 431 and above use the printed circuit Local Oscillator assembly.

For instruments bearing serial numbers 331-430, the Replaceable Parts List and the Schematic Diagram should be changed to the following:

Ref. No.	Description	Stock No.	Mfr.	Mfr. No.
C62	Capacitor, Variable	902800001	Sierra	SS-13416-1
C113	Capacitor, 150pf, ±2%, NPO Ceramic	901400151	Centralab	TCZ-150
C114	Capacitor, 47pf, N330, Ceramic	901440470	Centralab	TCA-47
C115	Capacitor, 6-14 pf, NPO, Glass trimmer	903000120	JFD	VC-11G
C116	Capacitor, 82pf, NPO, Ceramic	901410820	Centralab	TCZ-82
C117	Capacitor, 47pf, N470, Ceramic	901430470	Centralab	CC20
C118	Same as C115			
L19	Inductor, Variable	147791000	Sierra	SS-14779-1
L20	Inductor, Variable	147771000	Sierra	SS-14777-1
R82	Resistor, 27K, ±5%, 1/2 W, Fixed Comp.	905000273	AB	EB
R83	Resistor, 33K, ±10%, 1/2 W, Fixed Comp.	905200333	AB	EB
S6	Switch, Selector, 4 pole, 2 pos. 2 sect.	911200062	Sierra	SS-14669-1
XV10	Tube Socket, Turret, 9 pin Noval	914000032	Vector	8N12T

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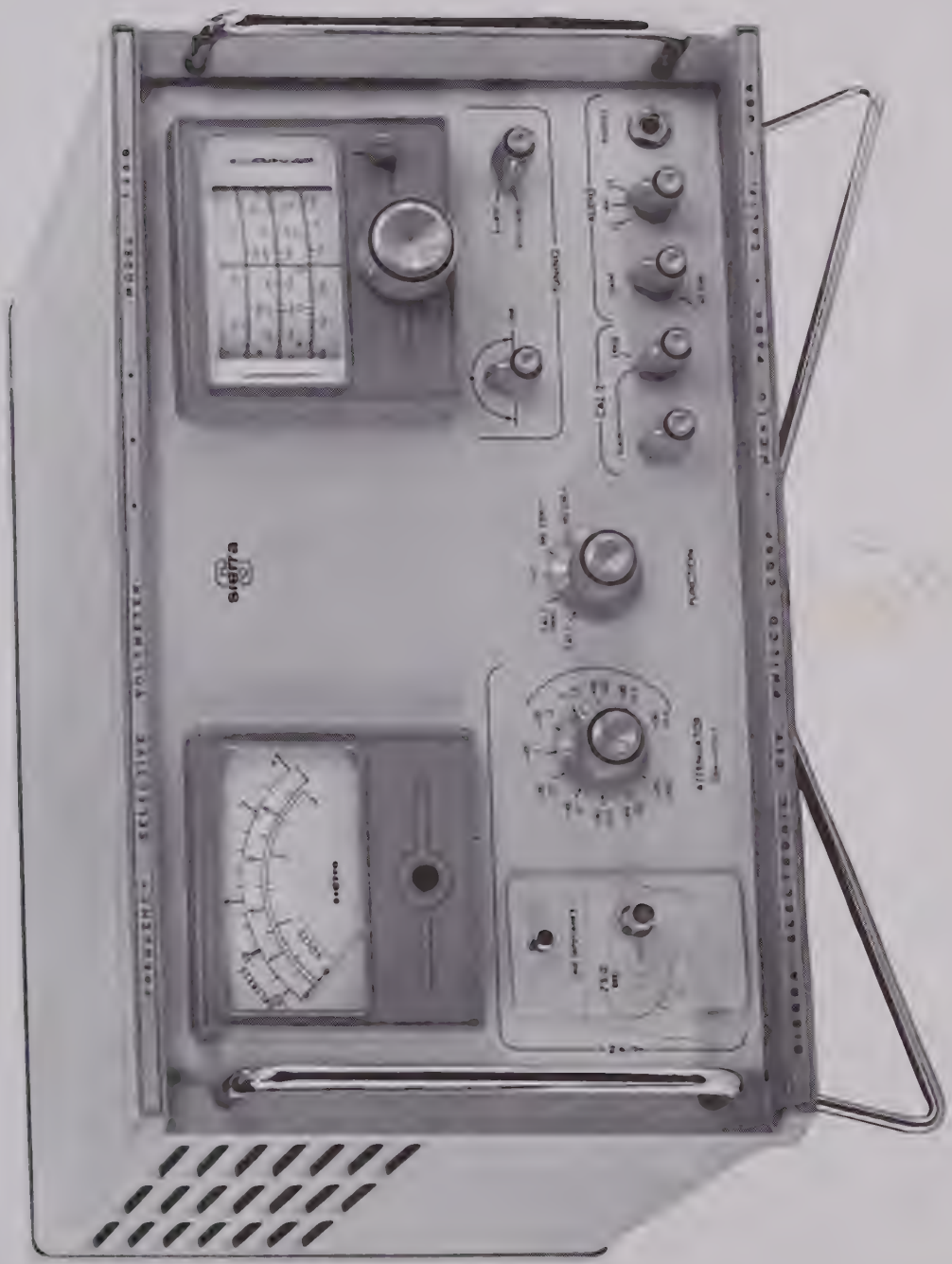

Figure 1-1. Model 126B Frequency Slective Voltmeter

SECTION I
GENERAL

A. PURPOSE

The Sierra Model 126B Frequency Selective Voltmeter measures a wide range of power levels and voltages with a high degree of accuracy over the frequency range of 5 kc to 1620 kc.

It may be used to measure signal or carrier levels, harmonics, noise, cross-talk, or interfering signals in communications systems or communications receiving and transmitting equipment. It can also be synchronously tuned when used with the Sierra Model 350A Tracking Signal Generator for making a frequency run on a transmission line or circuit of a communications system.

B. DESCRIPTION

1. General

The Model 126B Frequency Selective Voltmeter is direct reading in dbm with any of its accessories, when used across the impedance for which the accessory was designed. It reads volts directly across any impedance when used with the Model 126-600 plug in unit or the Model 126B/PA High Impedance Probe. A portion of the input circuit is formed by the voltmeter accessory, which is mounted in the front panel INPUT receptacle. When the Voltmeter is used with either plug-in unit accessory, Model 126-600, 126-135, or 126-75, it presents a high input impedance when bridged across 600 ohm, 135 ohm, or 75 ohm lines respectively. When used with the Model 126B/PA High Impedance Probe, it presents a very high impedance, making it suitable for general purpose measurements and wave analysis. The dbm output is read by algebraically adding the reading on the ATTENUATOR panel control to the meter reading.

The 126B components, for the most part, are mounted on printed circuit boards in order to eliminate the variations due to stray effects, therefore constant characteristics are maintained in all instruments. Long life and sustained performance are insured by the use of high temperature components and large derating factors. Accuracy and stability over long periods of time and wide ambient temperature variations are maintained by including in the instrument design a highly regulated dc supply and stabilized oscillators. Spurious and interfering signals are carefully controlled by thorough use of shielding and filtering networks.

Figure 1-2. Model 126-75, 126-135, 126-600 Plug-in Units

Figure 1-3. Model 126B/PA High Impedance Probe

2. Frequency Selective Voltmeter

In the selective mode, level range is from -90 dbm to +32 dbm (24.5 microvolts to 30 volts) with a bandwidth of either 250 cps or 2500 cps, over the frequency range of 5 kc to 1620 kc. A single conversion principle is used since it results in a minimum of spurious responses. The circuit also incorporates two bandwidths to provide either broad or restricted selectivity where required. The two bandwidths are obtained through the use of crystal filters in the intermediate frequency amplifier, selected with the front panel FUNCTION switch.

3. Flat Voltmeter

In the Flat Voltmeter mode the Model 126B operates as a broadband AC VTVM nearly flat from 5 kc to 1620 kc. In this mode the signal is fed directly from the attenuator to the Flat Amplifier. Since the mixer and intermediate frequency amplifier are by-passed and 60 db of gain is eliminated, the FUNCTION selector switch by-passes the -20 to -70 attenuator steps. This maintains the ATTENUATOR dial calibration, but limits the range from -30 dbm to +32 dbm which corresponds to a voltage range of 24.5 millivolts to 30 volts.

The flat voltmeter is very useful in obtaining a broad voltage measurement of the entire system under analysis. This measurement can be used to determine the relative level of the strongest signals in the system.

4. Accessories

The Model 126B accessories are an integral part of the input circuitry. They consist of removable plug in units, Model 126-600, 126-135, 126-75 and 126B/PA High Impedance Probe. Each of the accessories maintains the Model 126B over-all specifications. Accessories are available according to user requirements.

The Model 126-600 is used for 600 ohm systems. The input impedance of the Model 126B Voltmeter is nominally 39,000 ohms when used with this accessory. The bridging loss is always less than 0.3 db over the entire frequency range of 5 kc to 1620 kc. It can be used for either balanced or unbalanced systems. The captive shorting link is connected between the ground terminal and the lower binding post for use with unbalanced inputs.

The Model 126-135 is used for 135 ohm systems. The input impedance of the Model 126B Voltmeter is nominally 8,900 ohms when used with this plug-in accessory. The bridging loss is always less than 0.3 db over the entire frequency range of 5 kc to 1620 kc. It can be used for either balanced or unbalanced systems. The captive shorting link is connected between the ground terminal and the lower binding post for use with unbalanced inputs.

The Model 126-75 is used for 75 ohm systems. The input impedance of the 126B Voltmeter is nominally 5,000 ohms when used with this plug-in accessory. The bridging loss is always less than 0.3 db over the entire frequency range of 5 kc to 1620 kc. Input is unbalanced and connection is made by means of a BNC connector.

The Model 126B/PA High Impedance Probe consists of the Probe plug-in unit and a 30 db attenuator pad. The 30 db pad slips over the Probe tip and is used for high level signals. The cathode-follower in the Probe is powered by the 126B Voltmeter. Level range is from -90 dbm to +2 dbm, which corresponds to a voltage range of 24.5 microvolts to 1.0 volt. When used with the 30 db attenuator pad, the level range is from -60 dbm to +32 dbm, which corresponds to a voltage range of 775 microvolts to 30 volts. Input impedance is 50 megohms shunted by 6 picofarads.

For loud-speaker monitoring of the audio modulation on the signal being measured, a Universal Speaker Kit is available. The Kit includes a speaker and an audio amplifier mounted in a speaker case, with mounting hardware for installation on the Model 126B chassis. Output is 0.25 watts, undistorted. Power for operation is taken from the Model 126B power supply.

C. SPECIFICATIONS

FREQUENCY RANGE

Selective Voltmeter	
Wide Band (2500 cps)	10 kc to 1620 kc*
Narrow Band (250 cps)	5 kc to 1620 kc*
*In two frequency bands	5-810 and 810-1620 kc
Flat Voltmeter	5 kc to 1620 kc

INPUT LEVEL RANGE

With Models 126-600, 126-135, 126-75 (Line Bridging Transformers)	
Selective Voltmeter	-90 dbm to +32 dbm (24.5 μV to 30 volts)
Flat Voltmeter	-30 dbm to +32 dbm (24.5 mV to 30 volts)
With Model 126B/PA (High Impedance Probe)	
Selective Voltmeter	-90 dbm to +2 dbm (24.5 μV to 1.0 volt)
Flat Voltmeter	-30 dbm to +2 dbm (24.5 mV to 1.0 volt)
With Model 126B/PA and 30 db Attenuator Pad	
Selective Voltmeter	-60 dbm to +32 dbm (775 μV to 30 volts)
Flat Voltmeter	0 dbm to +32 dbm (0.775 volts to 30 volts)

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MEASUREMENT ACCURACY	
Selective Voltmeter	
Maximum Limit of Error	±1.5 db (-80 dbm to +32 dbm)
Probable Error	±0.8 db
Flat Voltmeter	
Maximum Limit of Error	±1.0 db (-20 dbm to +32 dbm)
Probable Error	±0.5 db
SELECTIVE VOLTMETER BAND-PASS	
Wide Band (2500 cps)	2500 ±200 cps 3 db down 14,000 Max. 60 db down
Narrow Band (250 cps)	250 ±50 cps 3 db down 1400 Max. 60 db down
DIRECT READING, Using Accessory:	
Model 126-600	Dbm or volts on 600 ohm, balanced or unbalanced lines
Model 126-135	Dbm on 135 ohm balanced or unbalanced lines
Model 126-75	Dbm on 75 ohm unbalanced lines
Model 126B/PA	Volts on unbalanced circuits of any impedance
INPUT IMPEDANCE, Using Accessory:	
Model 126-600	39,000 ohms nominal
Model 126-135	8,900 ohms nominal
Model 126-75	5,000 ohms nominal
Model 126B/PA	50 megohms shunted by 6 pf
LINE BRIDGING LOSS, Using	
Model 126-600	0.3 db maximum
Model 126-135	0.3 db maximum
Model 126-75	0.3 db maximum
TUNING ACCURACY	
At Room Temperature	±2 kc, 5 kc to 1620 kc
50° F to 120° F	±3 kc, 5 kc to 1620 kc

SPURIOUS RESPONSE		
Harmonic Distortion		Greater than 60 db down
Intermodulation Distortion		Greater than 50 db down
Direct IF and Image		Greater than 50 db down
CALIBRATION OSCILLATOR		100 kc ±0.01%
CARRIER REINSERTION OSCILLATORS		
Lower Sideband		2.2135 mc ±0.005%
Upper Sideband		2.2165 mc ±0.005%
POWER INPUT		105/125 volts, 50-1000 cps, 60 watts
	(optional)	210/250 volts, 50-1000 cps, 60 watts
AMBIENT TEMPERATURE RANGE		50°F to 120°F
OVERALL DIMENSIONS		
Width		17 inches
Height		10-1/8 inches
Depth		14-1/4 inches
WEIGHT (without accessories)		30 pounds

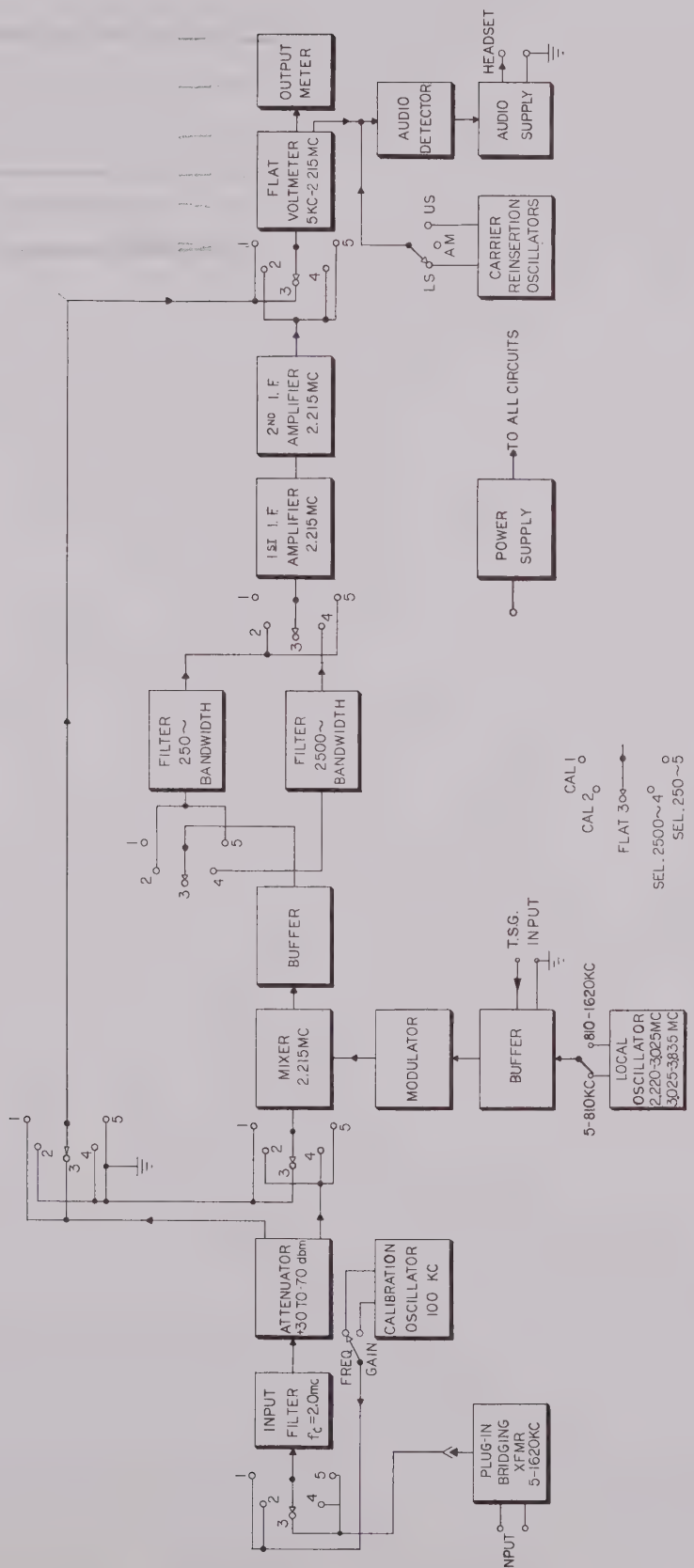

Figure 1-4. Functional Block Diagram, Model 126B

SECTION II
OPERATION

A OPERATING CONTROLS

Control	Use	Ref. No.
AC OFF	AC Power	S4
GAIN	Audio Gain Control	R68
PHONES	Headphone Jack	J6
TUNING	Frequency Tuning (two speed, in-out position)	C62
FINE	Fine Frequency Tuning	C65
5-810/810-1620	Frequency Range Selector	S6
FUNCTION	Mode of Operation Selector	S2
ATTENUATOR	Range Selector, db and volts (Volts with Model 126-600 and 126B/PA only)	
CAL 2 GAIN	Selective Voltmeter Gain Calibration	R45
CAL 2 FREQ	Selective Voltmeter Frequency Calibration	S5
INPUT	Receptacle for Desired Accessory	J5
LS-AM-US	Detector Mode Selector, AM or SSB	S3

B. OPERATIONAL CALIBRATION

1. Model 126B is calibrated for operation using the internal 100 kc oscillator. The output from this oscillator, when FUNCTION switch, S2, is in CAL 1 position, feeds a low distortion 100 kc signal to the input circuit of the Voltmeter. This establishes a reference level of approximately 0 dbm for the determination and adjustment of the CAL 2 (Gain) setting. It is the inherent accuracy and stability of the flat amplifier that determines the accuracy of the calibration of the Voltmeter.

NOTE

With the Voltmeter calibrated and operating normally, internally generated noise will deflect the meter slightly up-scale. This noise should not exceed the -20 db mark on the meter, and does not affect the measuring accuracy over the specified range.

Always be sure power is off before making the mechanical zero adjustment on the Output Meter.

Calibration procedure follows:

a. Allow fifteen minutes warmup

b. Set ATTENUATOR at 0 db.

c. Set FUNCTION at CAL 1.

d. Output meter will read approximately 0 dbm. Observe the exact reading of the meter (example: meter reads -0.5 dbm).

e. Set FUNCTION to CAL 2.

f. Set FINE tuning control to reference dot position.

g. Switch frequency band control to 5-810 position.

h. Adjust tuning dial for maximum output meter response at 100 kc. Tune carefully in slow drive position (tuning knob pushed in) and peak with FINE tuning control.

i. Set Frequency Hairline control to 100 kc mark on dial.

j. If necessary, adjust CAL 2 (Gain) control so that output meter reads the same level noted in the CAL 1 position (step d. above).

(Example: meter reading of -0.5 dbm.) The Voltmeter is now properly adjusted for measurement of external signals with reference to 0 dbm.

NOTE

An exact 0 dbm reading from the Calibration Oscillator (CAL 1 position) is not required in the calibration procedure. It is only necessary that the reading in the CAL 2 position be the same as the reading in the CAL 1 position. Accuracy of calibration depends on the stability and accuracy of the flat amplifier, not on the Calibration Oscillator level.

C. EXTERNAL SOURCE CALIBRATION

1. It may be desired to use an external oscillator for calibration of the Voltmeter at a specific frequency in order to obtain the greatest possible accuracy. Procedure for external source calibration for 600 ohm circuits is given below.

a. Set up a stable RF signal generator with 600 ohm output and a 600 ohm termination, preferably in the form of an indicating thermocouple. At some expense of accuracy, a non-inductive resistor and a VTVM may be used.

b. At the desired calibration frequency, establish a signal generator level of 0 dbm (0.775 volts across the 600 ohm terminating resistance).

c. Apply established 0 dbm power level to the voltmeter input terminals of the plug-in input transformer Model 126-600.

d. Set FUNCTION switch to either SEL 2500~ or SEL 250~.

e. Set Voltmeter ATTENUATOR at 0 db.

f. Adjust tuning dial and FINE tuning control for maximum indication on the output meter.

g. Adjust CAL 2 panel control for output meter reading of 0 db.

2. External source calibration for 135 ohm circuits may be accomplished in the manner described for 600 ohm calibration, substituting 135 ohm components in the external test circuit, and using Model 126-135 plug in transformer. The voltage corresponding to 0 dbm across the 135 ohm termination is 0.367 volts.

3. External source calibration for 75 ohm circuits may be accomplished in the manner described for 600 ohm calibration, substituting 75 ohm components in the external test circuit, and using plug in transformer Model 126-75. The voltage corresponding to 0 dbm across the 75 ohm termination is 0.274 volts.

4. External source calibration for the High Impedance Probe, Model 126B/PA, may be accomplished in the manner described for 600 ohm calibration, using a 600 ohm termination.

D. GENERAL MEASUREMENTS

1. General circuit measurement procedure is detailed in the following steps:

a. Calibrate Voltmeter using either procedure indicated above in paragraph B. or C.

b. Select mode of operation with FUNCTION switch (FLAT, SEL 2500 ~ or SEL 250 ~).

c. Connect Input terminals or Probe to signal to be measured.

d. Adjust tuning dial for maximum indication on output meter.

e. Peak output meter reading with FINE tuning control.

f. Set ATTENUATOR switch as required to obtain a reading in the upper portion of the output meter scale.

g. To obtain the signal amplitude in dbm, algebraically add the ATTENUATOR reading to the output meter reading.

2. Audio Monitoring.

a. In the SEL 2500~ position, headphones of 600 ohms impedance or higher, may be plugged into the PHONES jack to continuously monitor audio signals. A panel GAIN control is provided to set the audio to a comfortable listening level.

b. A Universal Speaker Kit is available (See addendum at back of book) which may be mounted on the Voltmeter chassis and wired into the audio circuit. When the Kit is installed, audio output may be monitored with the speaker, level being adjusted with the AUDIO GAIN control. When headphones are plugged in, the speaker is disconnected.

3. Use with Tracking Signal Generator.

a. Connect the interconnecting cable furnished with the Model 350A Tracking Signal Generator between the BNC connector on the rear of the 350A chassis and the jack, J7, marked TSG, on the rear of the 126B chassis.

b. Connect the Output of the Tracking Signal Generator to the sending end of the circuit to be tested, and adjust level.

c. Connect the Input of the Model 126B to the receiving end of the circuit to be tested and adjust for proper Output Meter level.

d. Tune the Tracking Signal Generator to the desired frequencies and read the levels on the Output Meter of the 126B. Tuning for both instruments is accomplished by the Tracking Signal Generator.

SECTION III
THEORY OF OPERATION

A. FUNCTIONAL DESCRIPTION

1. Input Circuit. The input circuit consists of a plug-in accessory, an input low-pass filter, a portion of the FUNCTION selector switch, and an attenuator network.

2. ATTENUATOR switch, S1, selects the portion of the attenuator network which corresponds to the panel marking, in 10 db steps from -70 db to +30 db.

3. FUNCTION switch, S2, in CAL 1 position feeds a 100 kc signal from the calibration oscillator through the attenuator to the flat amplifier. In CAL 2 position, the 100 kc signal is fed through a portion of the attenuator network (0 db position), through the mixer and crystal filter, FL1, to the IF amplifier, and then to the flat amplifier. The input signal is applied directly to the flat amplifier in the FLAT position of the FUNCTION switch, and to the mixer input in the SEL 2500~ and 250~ positions.

4. LOCAL OSCILLATOR. The local oscillator, V10, which provides the switching signal for the balanced modulator, tunes from 2.220 mc to 3.835 mc providing an intermediate frequency of 2.215 mc with 5 kc to 1620 kc input signals. The circuit is a two-band, highly stable, temperature compensated Hartley oscillator, transformer coupled to the modulator. Frequency determining components are the tapped variable inductance L19, and capacitors C113, C114, C115, C62, C63, C64, C65 for the high frequency range of 810 kc to 1620 kc. Variable inductance L20 and capacitors C116, C117, C118, C62, C63, C64, C65 are the frequency determining components for the low frequency range of 5 kc to 810 kc. The tuning drive mechanism is connected to the shaft of C62, the main tuning capacitor. Capacitors C63 and C64 are compensating capacitors providing negative temperature coefficient compensation. C65 is the FINE tuning panel control, an eccentric disc which electrically loads and unloads a tab on the main tuning capacitor, C62, for minute changes in frequency. Since C65 will rotate a full 360 degrees, to avoid tuning error, the FINE tuning control should be used over only 180 degrees as marked on the panel. Inductors L19 and L20 and capacitors C115 and C118 are for tracking adjustment purposes. Local oscillator output is fed to cathode follower, V10B, for isolation and impedance matching.

The local oscillator bezel assembly has an adjustable Hairline which, in association with the internal calibration oscillator, makes it possible to set the tracking accurately at every 100 kc multiple, for improved tracking within that particular dial area.

5. MIXER AND MODULATOR. Mixer, V1, is essentially an amplifier, the gain of which is varied at the rate of the local oscillator frequency (2.220 mc to 3.835 mc).

The Balanced Modulator, consisting of CR4, CR5, CR6 and associated components, acts as a switch which returns the cathode of V1 to AC ground through R100 and C70. During half of the input cycle to the modulator, the balanced diodes conduct, and the cathode resistor, R20, is by-passed, to AC, to ground through C70, allowing V1 to function as an amplifier whose gain is on the order of 20 db, with R19 providing the cathode bias. During the other half of the input cycle, the diodes are non-conducting, and the modulator output is seen as a high impedance through C70. This places R20 in the cathode circuit of V1, biasing it to the point that gain through the mixer stage is about unity. The RF voltage component from the local oscillator has been balanced out in the modulator, but there are high order components in the mixer whose frequencies are the sum and difference of the input signal and the local oscillator signal, although essentially no RF voltage appears in the mixer output (local oscillator signal is down 35 db to 50 db at the modulator output). Therefore the local oscillator may be tuned to within 5 kc of the IF frequency without feeding through the mixer IF section where it would otherwise appear as a spurious signal giving an erroneous indication on the output meter. The plate tank of the mixer is tuned to the intermediate frequency, 2.215 mc. The signal is then fed through the cathode follower, V2, to the crystal filter FL1 or FL2.

6. CRYSTAL FILTERS. Two selectivity positions are available in selective frequency operation using crystal filters, FL1 and FL2, with center frequencies of 2.215 mc, and bandwidths of 2500 cycles and 250 cycles. The output impedance of the cathode follower, V2, is about 4000 ohms, matching the input of the filters. The resistive T-pad network formed by resistors R34 through R37 provides a means of matching the filters to the IF amplifier. R42 balances the filter outputs to provide signals of equal amplitude for the IF amplifier. Output of the T-pad is applied to the grid of V3.

7. IF AMPLIFIER. The IF amplifier is made up of two RC coupled pentode stages, V3 and V4, which provide a combined gain of about 45 db. Only two single tuned circuits, L4-C24 and L5-C36, are used, in order to minimize the number of tuned circuit elements susceptible to temperature gain instability. CAL 2 (Gain) control, R45, provides a means of varying the IF gain through a range of at least 3 db either side of the nominal gain. Output of the IF amplifier is applied to the grid of V5, the first flat amplifier stage, through S2b.

8. FLAT AMPLIFIER. Three RC coupled pentode stages feeding an associated output meter constitute the wide band flat amplifier section. This amplifier has a gain of about 35 db, incorporating approximately 20 db of feedback to provide gain stability. Output meter readings are stable within 0.11 db for a line voltage change of ±10 percent, and for variations in tube g_m of up to 25 percent.

Output from the last IF stage, V4, is carried through S2b (in CAL 2, SEL 2500~ and SEL 250~ positions) to the grid of V5, the input stage of the flat amplifier. Coupling capacitor, C14, is a relatively small value (510 pf), and in conjunction with R56, provides a smooth fall-off in response below 1 kc. High frequency fall-off is controlled by capacitors C39 and C52 with R71, R51 and R64. The signal is further amplified in V6, and coupled to V7. Output of the three-stage amplifier is applied to the full-wave

bridge rectifier circuit. Output meter, M1, is connected across the bridge, and current through the one milliampere movement is proportional to the average AC voltage applied to the bridge.

In the CAL 1 and FLAT position of the FUNCTION selector switch, S2, signals other than 2.215 mc are applied to the flat amplifier. In CAL 1, the 100 kc signal from the calibration oscillator is used as a reference against which the gain through the input-mixer-IF section is set to calibrate the voltmeter. When S2 is in FLAT position, signals from 5 kc to 1620 kc may be fed to the voltmeter and are applied through the attenuator directly to the flat amplifier.

9. AUDIO AMPLIFIER. A portion of the output of the last flat amplifier stage is coupled from a plate resistive dividing network to the audio amplifier input. The audio components of the signal are detected by a simple crystal diode demodulator made up of CR3, L8, R67 and C54. The GAIN control, R68, determines the amplifier output level. The amplifier itself is a two-stage, twin-triode, RC coupled circuit, the output of which is terminated at the panel mounted PHONES jack, J6.

When the Universal Speaker Kit is installed the audio output is applied to the audio amplifier in the speaker enclosure. Audio output is also available at the PHONES jack, however, when headphones are plugged in, the speaker is cut off.

10. CALIBRATION OSCILLATOR. To provide a self-calibration capability, Model 126B includes an internally mounted 100 kc signal source which is applied, in CAL 1 position of the FUNCTION selector switch, through the input attenuator to the flat amplifier, and in CAL 2, to the mixer IF section. The temperature compensated 100 kc oscillator is a modified crystal-controlled Pierce circuit which generates a signal of constant amplitude. Frequency accuracy is 0.01 percent over the specified temperature range. This signal is used to calibrate the mixer IF gain when used in the CAL 2 position. Output level is set with screw driver adjusted calibration potentiometer, R87.

When the CAL 2 GAIN FREQ switch, S5, is held in the FREQ position, it provides a signal rich in harmonics which is used to check oscillator tracking and tuning dial accuracy. The harmonics occur at every multiple of 100 kc between 100 kc and 1600 kc.

11. POWER SUPPLY. The power supply for the Model 126B is made up of a full-wave silicon diode bridge rectifier, CR7-CR10, a series regulator, V11, with a twin triode control amplifier, V12 and a voltage reference tube, V13. DC drift due to the effect of filament voltage changes in V12 is cancelled by differential action between the two sections. Voltage adjustment potentiometer, R113, establishes the operating level of the series regulator, and consequently the output voltage. Output voltage is maintained at 225 volts, with regulation better than 0.25 percent over a line voltage variation of 105 to 125 volts. Ripple amplitude is less than one millivolt. Input transient protection

is provided by an RC network, R99-C88, in the primary of T3.

12. CARRIER REINSERTION. For audio demodulation of single-sideband signals, this instrument includes in its circuitry two crystal controlled carrier reinsertion oscillators operating 1.5 kc below and 1.5 kc above the intermediate frequency respectively, and a cathode follower isolation amplifier. One of these two signals, as selected by front panel switch LS-AM-US, S3, is applied through the cathode follower stage to the diode demodulator at the input of the audio amplifier where it is combined with the carrier-suppressed sideband signal from the output of the flat amplifier. The reinserted carrier from the internal oscillator provides an RF base against which sideband signals beat, forming a combined signal which is reduced to its audio components at the demodulator. The demodulation mode switch LS-AM-US selects the proper oscillator and applies plate voltage for its operation. All three triode stages of the circuit are combined in a single envelope, V14.

13. USE WITH TRACKING SIGNAL GENERATOR. The Sierra Model 350A Tracking Signal Generator is designed to be used with the Model 126B Frequency Selective Voltmeter.

When the Tracking Signal Generator interconnecting cable is plugged into J7 on the rear of the chassis of the Model 126B, the plate supply voltage is removed from the 126B Local Oscillator and buffer amplifier, and the Tuning Oscillator signal from the Tracking Signal Generator is fed into the input transformer, T2, of the balanced modulator. See Figure 2-1 and Schematic Diagram Figure 3-3. In use, the Tuning Oscillator signal of the Tracking Signal Generator takes the place of the Local Oscillator of the Model 126B, permitting the instruments to be synchronously tuned by the adjustment of the frequency dial of the Tracking Signal Generator only.

SECTION IV
MAINTENANCE

A. CALIBRATION ADJUSTMENTS

1. GENERAL. Calibration procedures described in this section may be conducted independently after the Flat Voltmeter operation has been checked, since the rest of the Voltmeter operation depends on this function. If difficulty in obtaining proper adjustment is encountered, improper functioning of a circuit component is the probable cause. See paragraph B. for Trouble Shooting information and Table 3-1 Trouble Shooting tips.

2. POWER SUPPLY ADJUSTMENT. Using a DC VTVM, perform the following steps:

a. Connect the DC VTVM between TP1 and chassis ground.

b. Adjust R113 for an output voltage of 225 volts.

c. Vary the line voltage from 105 to 125 volts. Output voltage should not change more than 0.6 volts.

d. Using an AC VTVM and short, shielded leads connected between TP1 and chassis, observe ripple and noise components. They should not exceed 1.0 millivolt over a line voltage variation of 105 to 125 volts. Whenever noise and ripple combined are less than 1.0 millivolt, regulation will be within specifications.

3. FLAT VOLTMETER ADJUSTMENT. Allow fifteen minutes for warmup. When circuits have stabilized, follow procedure given below:

a. Insert plug-in transformer Model 126-600.

b. Set FUNCTION switch to FLAT.

c. Set ATTENUATOR to 0 db.

d. Connect a low distortion RF signal generator to the input binding posts.

e. Connect AC VTVM across input binding posts.

f. Accurately set signal generator for 0 db (0.775 volts) at 200 kc.

AMCC SOURCE DATA
PROPERTY OF U. S. GOV'T.

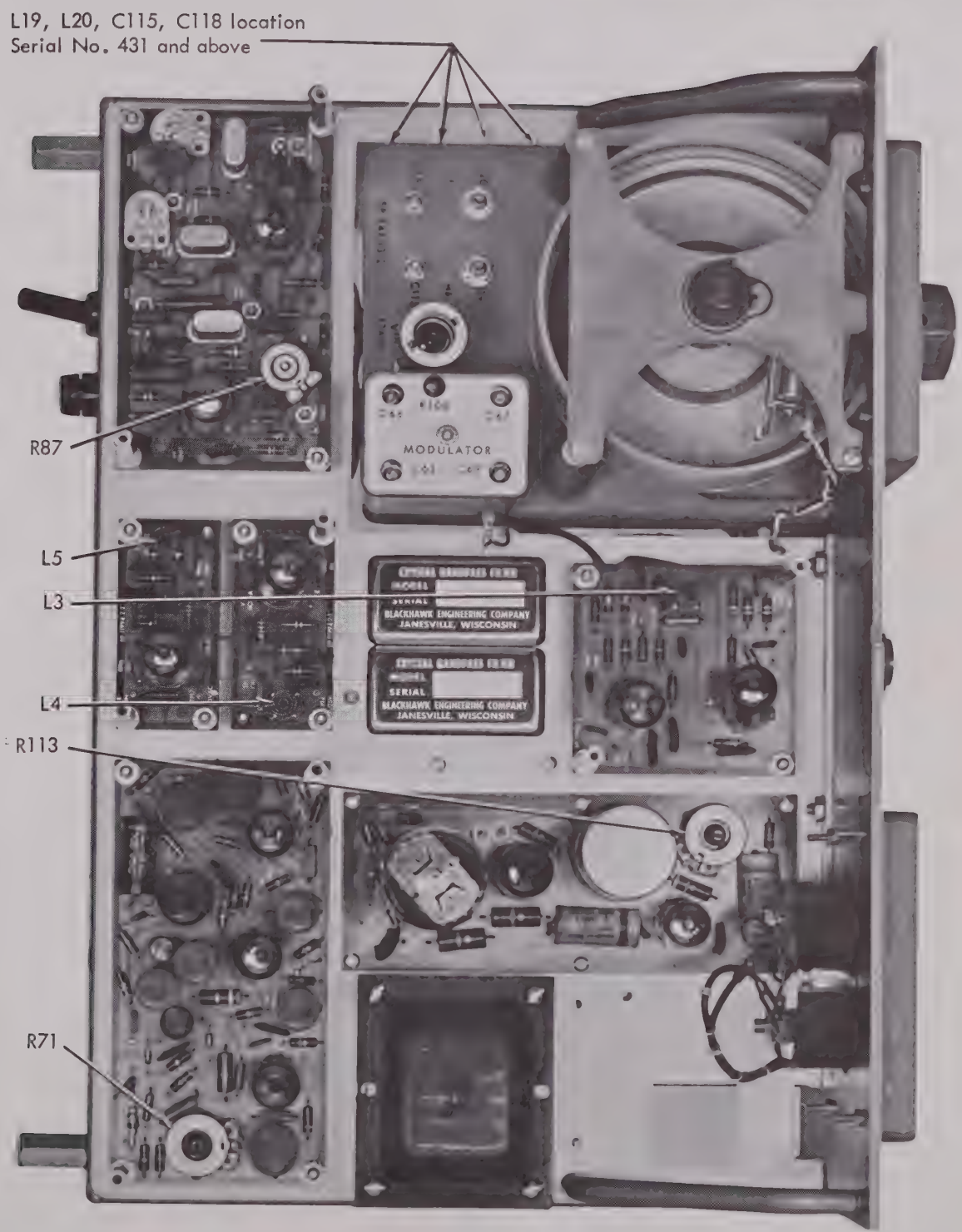

Figure 4-1. Component Identification, Model 126B, Top View

g. Adjust amplifier gain with R71 for an output meter reading of 0 dbm.

h. Tune signal generator successively to 5 kc, 100, 200, 400, 600, 800, 1000, 1200, 1400, 1620 kc at 0 db level and record output meter readings for each frequency. Variation should be less than ±0.3 db.

i. Repeat step h. with Model 126-135 plug-in transformer. Output meter should read 0 db with an input signal of 0.367 volts, within ±0.3 db.

j. Repeat step h. with Model 126-75 plug-in transformer. Output meter should read 0 db with an input signal of 0.274 volts, within ±0.3 db.

k. Repeat step h. with Model 126B/PA High Impedance Probe. Output meter should read 0 db with an input signal of 0.775 volts, within ±0.3 db.

4. OUTPUT METER LINEARITY determination requires an attenuator of 600 ohms impedance and an RF signal generator. Procedure follows:

a. Apply a 100 kc, 0 db (0.775v) signal to Model 126-600 through external attenuator.

b. Set external attenuator for zero attenuation.

c. Set FUNCTION switch to FLAT, ATTENUATOR to 0 db. Output meter should read 0 db.

d. Attenuate the input signal in 1 db steps to -10 db, recording the output meter reading at each step. All readings should be within ±0.2 db of the actual attenuated input level.

e. Increase attenuation to -15 db. Output meter should read within ±0.5 db.

f. Increase attenuation to -20 db. Output meter should read within ± 1.0 db.

5. IF AMPLIFIER PRELIMINARY ADJUSTMENT. Initial adjustment procedure follows:

a. Set FUNCTION switch to SEL 2500~.

b. Set ATTENUATOR to 0 db.

c. Set CAL 2 fully clockwise.

AMCC SOURCE DATA
PROPERTY OF U. S. GOV'T.

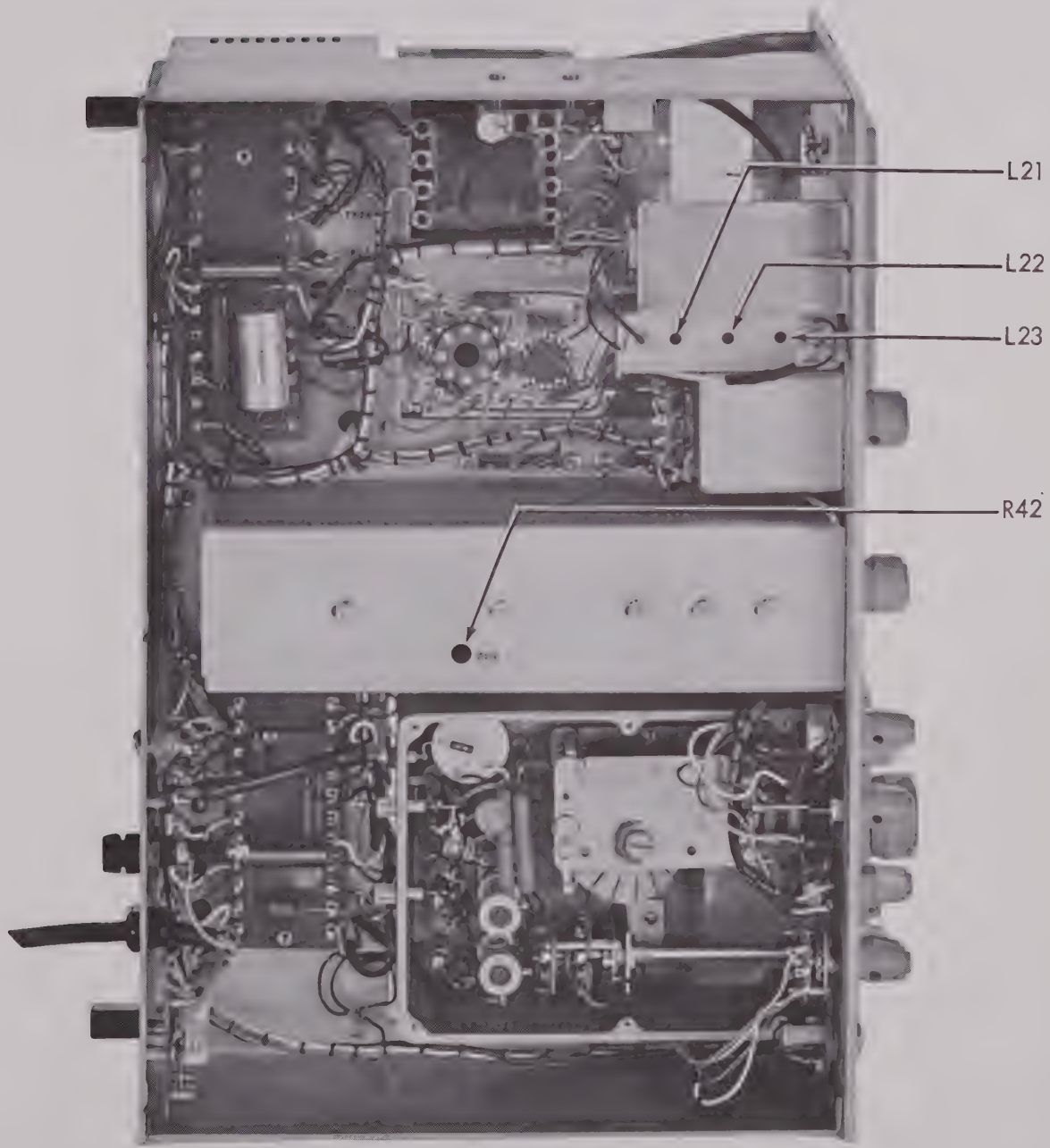

Figure 4-2. Component Identification, Model 126B, Bottom View

d. Feed a 2.215 mc signal from an external RF source to TP6, at a level which will give half-scale deflection of the output meter.

e. Tune L3, L4 and L5 for maximum meter indication. Reduce input signal as required to maintain approximately half-scale indication.

6. LOCAL OSCILLATOR ADJUSTMENT. Following a one hour warm-up period, track the local oscillator in the following manner:

a. Low Frequency Range.

(1) Set FUNCTION switch to SEL 2500 ~.

(2) Set ATTENUATOR to 0 db.

(3) Set FINE tuning control at midpoint. Set Hairline control at reference position. Set Tuning range at 5-810.

(4) Set Tuning dial to 5 kc.

(5) At 0 db level, feed a 5 kc signal to voltmeter and tune L20 for maximum meter indication.

(6) Set Tuning dial to 810 kc.

(7) At 0 db level, feed an 810 kc signal to voltmeter and tune C118 for maximum meter indication.

(8) Repeat steps (4) through (7) as needed to set upper and lower extremes of the band on frequency.

(9) Check intermediate points on tuning dial. Frequency should read correctly within ±2 kc.

b. High Frequency Range.

(1) Set FINE tuning control at midpoint. Set Hairline control to reference position. Set Tuning range to 810-1620.

(2) Set Tuning dial to 810 kc.

(3) At 0 db level, feed an 810 kc signal to Voltmeter and tune L19 for maximum meter indication.

(4) Set Tuning dial to 1620 kc.

(5) At 0 db level, feed a 1620 kc signal to Voltmeter and tune C115 for maximum meter indication.

(6) Repeat steps (3) through (6) as needed to set upper and lower extremes of the band on frequency.

(7) Check intermediate points on tuning dial. Frequency should read correctly within ±2 kc.

7. MODULATOR ADJUSTMENT. Balanced modulator adjustment requires the use of an oscilloscope. Procedure follows:

a. Turn instrument on and allow a fifteen minute warm-up period.

b. Set FUNCTION switch to SEL 2500 ~ .

c. Remove modulator cover and with the oscilloscope read the RF envelope amplitude alternately at C66 and C67, adjusting R100 until the two amplitudes are equal.

d. Replace the modulator cover, tune toward the low frequency end of the dial until meter reads almost full scale.

e. Tune C66, C67, C68 and C69 for minimum signal indication, until the residual output meter reading is as low as possible. Bring tuning dial down to below 5 kc and continue to tune for lowest output meter reading possible. Residual reading at 5 kc should not exceed -20. A non-metallic screwdriver must be used to tune the capacitors.

NOTE

The meter reading during preceding steps is not affected by the attenuator. Detected voltage is due to local oscillator feed-through.

f. Connect a 100 kc, 0 db signal to voltmeter input, through a 100 kc low-pass filter.

g. Set ATTENUATOR to 0 db, tune voltmeter to 100 kc signal and set CAL 2 for a 0 db meter reading.

h. Tune voltmeter to second and higher harmonics (200 kc, 300 kc, etc.). Adjust ATTENUATOR for upper half scale meter reading. Harmonics must not be greater than -63 db.

i. If harmonics exceed -63 db, trim R100 to obtain proper reading, then disconnect 100 kc signal and repeat steps d. and e.

NOTE

If difficulty is experienced in maintaining minimum feed-through signal indication, it may be due to poor grounding between RF tuning casting and chassis. Check ground lead from casting to chassis.

8. CALIBRATION OSCILLATOR OUTPUT. No provision is made for adjustment of the calibration oscillator frequency. For a frequency check if desired, measured frequency at TP9, using an accurate counter or frequency meter, it should be 100 kc ±0.01 percent.

The calibration oscillator RF output level is set in the following manner:

a. Set FUNCTION switch to CAL 1.

b. Set ATTENUATOR to 0 db.

c. Adjust R87 for an output meter reading of 0 dbm.

9. IF AMPLIFIER FINAL TUNING.

a. Set FUNCTION switch to SEL 250~.

b. Set ATTENUATOR to 0 db.

c. Set CAL 2 at mid-position.

d. Apply a 100 kc, 0 db signal to the input of the voltmeter.

e. Tune voltmeter to the input signal, and peak output meter indication with the FINE tuning control.

f. Tune L3, L4 and L5 for maximum output meter deflection.

10. CAL 2 RANGE. With a 0 db input signal and CAL 2 control set fully clockwise, output meter should read at least +3 db. With CAL 2 control turned fully counterclockwise, reading should be at least - 3 db.

11. 2500 CYCLE BANDWIDTH CHECK. Although the 2500 cycle and 250 cycle crystal filters are not adjustable, a complete calibration procedure should include a check of filter response. A method of determining bandwidth is described below:

a. Set ATTENUATOR to 0 db.

b. Set FUNCTION switch to SEL 2500 ~ .

c. Apply a 0 db signal at 100 kc to input of voltmeter.

d. Tune voltmeter to incoming signal and adjust CAL 2 for 0 db output meter indication.

e. Increase input signal frequency above 100 kc until output meter indication decreases 3 db. Record frequency.

f. Decrease input signal frequency from 100 kc until output meter indication decreases 3 db. Record frequency.

The sum of the differences in frequency obtained in steps e. and f. is the nose width of the response curve at 2500 cycles and should be 2500 ±200 cps. Using the same technique, the 60 db bandwidth should be less than 14 kc.

12. 250 CYCLE BANDWIDTH CHECK. Using the method described in paragraph 11., bandwidth at the 3 db points of the 250 cycle filter should be 250 ±50 cps and the 60 db points less than 1400 cycles.

13. FILTER OUTPUT LEVEL MATCHING. The crystal filter outputs are balanced as follows:

a. Set FUNCTION switch to SEL 250 ~ .

b. Apply a 100 kc, 0 db signal to voltmeter input. Tune carefully for maximum output meter indication. Record meter reading.

c. Set FUNCTION switch to SEL 2500 ~ .

d. If reading varies from that recorded in step b., adjust R42 so that output meter indications are the same for steps b. and c.

14. ATTENUATOR STEP CHECK. The attenuator is checked using a signal generator, and external decade attenuator and an AC VTVM accurate to 1 percent. Use AC VTVM to set level of signal generator. Procedure follows:

a. Set ATTENUATOR to +20 db.

b. Set FUNCTION switch to SEL 250~.

c. Insert plug-in transformer Model 126-600.

d. Apply a 100 kc signal at +20 db (7.75 volts) to voltmeter unbalanced input. Output meter should read 0 db.

e. Switch ATTENUATOR to +30 db. Output meter should read -10 db.

f. Attenuate input signal 10 db using decade attenuator and switch voltmeter ATTENUATOR to +10 db. Output meter should read 0 db ±0.4 db.

g. Attenuate input signal in 10 db steps while increasing voltmeter sensitivity in 10 db steps to -70 db. Output meter should continue to indicate 0 db ±0.4 db.

h. Repeat steps a. through g. using Model 126-135 plug-in transformer. Set input signal level to 3.68 volts.

i. Repeat steps a. through g. using Model 126-75 plug-in transformer. Set input signal level to 2.74 volts.

j. Set ATTENUATOR to 0 db. Set FUNCTION switch to SEL 250~. Insert Model 126B/PA High Impedance Probe into voltmeter input.

k. Apply a 100 kc signal at 0 db to the probe. The output meter should read 0 db ±0.1 db. If not, disassemble probe and adjust trimmer capacitor, C3. See paragraph B.3. for probe disassembly procedure.

l. Attenuate signal in 10 db steps while increasing voltmeter sensitivity in 10 db steps to -70 db. Output meter should remain accurate within +0.4 db.

m. Slip the 30 db attenuator pad over the probe tip. Apply a 100 kc signal at +30 db to the probe and set the voltmeter attenuator to 0 db. The output meter reading should be 0 db ±0.1 db. If different, remove pad tip and adjust trimmer capacitor C1.

n. Attenuate signal in 10 db steps while increasing voltmeter sensitivity in 10 db steps to -30 db. Output meter should remain accurate to ±0.5 db.

o. As a check the above steps may be repeated at 1620 kc.

15. SELECTIVE VOLTMETER RESPONSE. Using a signal generator and an AC VTVM to set signal generator level determine voltmeter linearity in selective operation using the following procedure:

a. Insert Model 126-600 plug-in transformer. Set FUNCTION switch to SEL 250~. Set tuning range to 5-810.

b. Set ATTENUATOR to 0 db.

c. Apply 100 kc signal at 0 db to voltmeter input and tune for maximum output meter indication.

d. Adjust CAL 2 for 0 db on output meter.

e. At 5 kc, 100, 200, 300, 400, 500, 600, 700, 810 kc, all at 0 db input level, all readings should be 0 db ±0.2 db.

f. Set Tuning range to 810-1620.

g. Apply 810 kc signal at 0 db to voltmeter input. Output meter reading should be within 0.2 db of reading for 810 kc obtained in step e.

h. At 900, 1000, 1200, 1300, 1400, 1500, 1620 kc, all at 0 db input level. All readings should be within ±0.2 db of the level obtained for 810 kc in step g.

i. Repeat step a. through h. using Model 126-135 plug-in transformer.

j. Repeat step a. through h. using Model 126-75 plug-in transformer.

k. Repeat step a. through h. using Model 126B/PA High Impedance Probe.

16. INPUT LOW-PASS FILTER ADJUSTMENT. This adjustment should only be attempted if a Sierra Model 351A Signal Generator or equivalent is available. Accurate frequency setting and level adjustment is important as well as proper match between Signal Generator and the plug-in transformer.

a. Set Voltmeter FUNCTION switch to SEL 2500~, ATTENUATOR to 0 db, Tuning to 100 kc. Use Model 126-75 plug-in transformer.

b. Set 351A Signal Generator ATTENUATOR to 0 db, IMPEDANCE to 75Ω, Tuning to 100 kc.

c. Adjust the voltmeter CAL 2 control to read 0 db on the output meter.

d. Leave the voltmeter set at 100 kc. Change the 351A frequency to 2215 kc and the voltmeter ATTENUATOR to -50 db. Tune the 351A for maximum indication on the voltmeter. Adjust L23 for minimum meter indication.

e. Change the 351A frequency to 2315 kc and tune the voltmeter for a maximum indication at approximately 50 kc. Adjust L21 for minimum meter indication.

f. Set the voltmeter attenuator to 0 db and tune the 351A oscillator and voltmeter to 1200 kc. Adjust L22 for a maximum meter indication.

g. Tune the 351A oscillator and the voltmeter to 1620 kc and check that the output meter reading is 0 db ±0.3 db. Readjust L22 slightly if necessary.

h. Recheck steps c. through g. because of possible interaction between the tuned inductors.

17. INTERMODULATION MEASUREMENT. Frequencies of 72.5 kc and 100 kc at 0 db level are fed to the voltmeter input through a suitable mixing pad to determine the intermodulation products levels.

a. Set FUNCTION switch to SEL 250~and set ATTENUATOR to 0 db. Use suitable plug-in transformer.

b. Disconnect 100 kc generator and adjust 72.5 kc generator output and CAL 2 control for 0 db on output meter.

c. Disconnect 72.5 kc generator and connect 100 kc generator. Adjust generator level until output meter reads 0 db. Do not change CAL 2 adjustment.

d. Reconnect both generators to the voltmeter input.

e. Tune the voltmeter to the following frequencies with ATTENUATOR set at -50 db: 27.5 kc, 45.0 kc, 127.5 kc, 172.5 kc, 245.0 kc, 272.5 kc. These are all sum or difference frequencies and should be greater than 60 db down (less than -60 db).

18. NOISE LEVEL. Normal noise in the instrument is SEL 2500~position is about -20 db or less with CAL 2 fully clockwise. Most circuit noise is generated in the mixer stage and cannot be eliminated without degrading mixer performance. This noise does not affect the instrument accuracy over the specified range.

19. TRACKING SIGNAL GENERATOR TRACKING TEST. If a Sierra Model 350A Tracking Signal Generator is available, the following test may be performed:

a. Terminate the Tracking Signal Generator (TSG) output with a 600 ohm resistor and connect to 126B input. Use Model 126-600 plug-in transformer.

b. Tune the TSG to 100 kc and set the ATTENUATOR and LEVEL controls for 0 db output, set IMPEDANCE control to 600Ω.

c. Tune the voltmeter to 100 kc and set the ATTENUATOR and CAL 2 control for a 0 db output meter reading.

d. Plug the interconnecting cable into the TSG jack on the rear of

the voltmeter. Note and record the voltmeter output meter deviation from 0 db.

e. Tune the TSG to 5 kc, 810 kc, (lower band) and 810 kc, 1620 kc, (upper band). Keep the TSG output at 0 db. Note and record the voltmeter output meter deviation from 0 db.

f. All readings under d. and e. shall be within ±0.3 db of the frequency response readings obtained in paragraph A. 15.

g. If difficulty is encountered, check for correct voltmeter modulator balance.

B. MAINTENANCE

1. TROUBLE SHOOTING. Improper component operation usually can be traced rapidly using a sectionalizing system, together with references to the equipment Block and Schematic diagrams. First, determine the correct operation of the power supply, checking the output voltage and ripple content. Excessive ripple and noise are due to power supply or decoupling network failure. Second, determine that the flat amplifier operates correctly, since all other voltmeter operation depends on it. Then check the mixer, IF amplifier and local oscillator sections. Occasionally coupling or decoupling capacitors leak only under conditions of high ambient temperature, and removal of the equipment from its cabinet may cause the fault to disappear. Microphonics are usually caused by poor switch contact, or defective tubes. For resistance and voltage measurements, refer to Tables 4-2 and 4-3. For trouble shooting tips see Table 4-1.

2. Care should be exercised in working on printed circuit boards. Remember that prolonged application of high heat will damage or destroy the board and its circuitry. Use a clean iron and judicious application of heat to remove circuit components. Remount all components flat against circuit board.

3. PROBE DISASSEMBLY. To gain access to the Model 126B/PA circuitry, proceed as follows:

a. Loosen probe cable packing gland.

b. Hold body and tip firmly in place with respect to each other. Rotate assembly ring CCW and they will separate. Rotation of the probe tip with respect to the body will damage the electrical assembly. (The assembly ring has both a right- and a left-hand thread.)

c. Slide body back on cable.

TABLE 4-1. TROUBLE SHOOTING TIPS

TROUBLE INDICATION	POSSIBLE CAUSE
Inoperative, panel switch On	No line voltage Fuse F1 blown
Fuse F1 Blown	Defective diode in power supply Short in DC circuitry Short in filament circuit
No meter reading in CAL 1 position	Calibration oscillator, faulty tube or component Flat amplifier, faulty tube or component Attenuator, fualty component Function switch, poor contact, broken wafer Calibration oscillator output shield lead shorted or open
No meter reading in CAL 2, SEL 2500~, or SEL 250~ position but CAL 1 functions properly	Local Oscillator, faulty tube or component Mixer, faulty tube or component IF amplifier, faulty tube or component Function switch, poor contact, broken wafer
Unable to set 0 db in CAL 2 position	Local oscillator output low IF stages detuned Modulator diodes or components defective
Excessive "no signal" meter indication	Modulator detuned Loose oscillator or modulator cover Modulator diodes or components defective

TABLE 4-1. TROUBLE SHOOTING TIPS (continued)

TROUBLE INDICATION	POSSIBLE CAUSE
Non-linear Output Meter response	Defective meter diodes Defective meter
Unable to tune incoming signal but CAL 2 operates correctly	Open input circuit Defective plug-in transformer Faulty FUNCTION SELECTOR SWITCH
Frequency Tuning error	Local oscillator not tracking properly Loose dial drum or variable capacitor coupling Local oscillator faulty component
Unequal readings between SEL 2500~ and SEL 250~	Filter output level not matched Defective filter
Poor regulation of power supply output	Excessive line voltage variations Defective tubes or components in power supply or regulator
Excessive DC output	Faulty regulator, control or reference tube or faulty component.

TABLE 4-2. RESISTANCE VALUES

TEST POINT		RESISTANCE TO CHASSIS, OHMS
Power Supply		
T3	term. 1 and 2	Inf.
T3	term. 7 and 8	Inf.
T3	term. 3 and 4	20K
T3	term. 5	0.5 max
T3	term. 6	0
V11	pin 1	560K
V11	pin 3 (TP1)	20K
V12	pin 1	560K
V12	pin 2	560K
V12	pin 3	18K
V12	pin 6	560K
V12	pin 7	95K
V12	pin 8	22K
V13	pin 1,5	95K
V13	pin 2, 4, 7	0
Mixer		
TP4		30K
TP7		4.7K
TP8		Inf.

TEST POINT	RESISTANCE TO CHASSIS, OHMS
Local Oscillator	
V10 pin 1	60K approx.
V10 pin 2	100K
V10 pin 3	0.3
V10 pin 6	30K
V10 pin 7	1 meg
V10 pin 8	1K
C76 TP29	30K
Modulator	
TP31	4700
T2 term. 1	4.6
T2 term. 3 and 5	0
T2 term. 4	45
T2 term. 6	45
IF Amplifier	
TP13	2.2K
TP14	30K approx.
TP15	0.11
TP16	0.11
TP18	0 to 2.5K
TP19	30K approx.
TP20	0.11

TABLE 4-3. VOLTAGE REFERENCE CHART

TEST POINT		VOLTAGE*
Power Supply		
TP1		225 vdc ±0.6v (105 to 125 vac)
TP2 to TP3		6.3 vac
V11	pin 5	350 vdc
V12	pin 1	210 vdc
V12	pin 2,6	130 vdc
V12	pin 3	132 vdc
V12	pin 8	86 vdc
V13	pin 1,5	87 vdc
Mixer-Cathode Follower		
TP4		225 vdc
TP5		6.3 vac
TP6		Variable ac, signal
TP7		34 vdc
V1	pin 5	198 vdc
V1	pin 6	145 vdc
V2	pin 2	2.4 vdc
V2	pin 5,6,7	47 vdc
IF Amplifier		
TP13		Variable ac,signal
TP14		225 vdc
TP16		Variable ac,signal
TP19		225 vdc

TEST POINT		VOLTAGE*
IF Amplifier (contd)		
TP20		Variable ac, signal
V3	pin 2	0.5 vdc
V3	pin 5	74 vdc
V3	pin 6	40 vdc
V4	pin 2	9.1 vdc (R45 at max.
V4	pin 5	156 vdc resistance)
V4	pin 6	120 vdc
Flat Amplifier		
V5	pin 2,7	0.6 vdc
V5	pin 5	131 vdc
V5	pin 6	62 vdc
V6	pin 2,7	1 vdc
V6	pin 5	200 vdc
V6	pin 6	100 vdc
V7	pin 2,7	1.0 vdc
V7	pin 5	155 vdc
V7	pin 6	100 vdc
TP25, TP26		154 vdc
Calibration Oscillator		
TP10		225 vdc
V9	pin 3	0.9 vdc
V9	pin 6	62 vdc
V9	pin 8	12 vdc

*Measurements made with 20K/ohms/volt meter

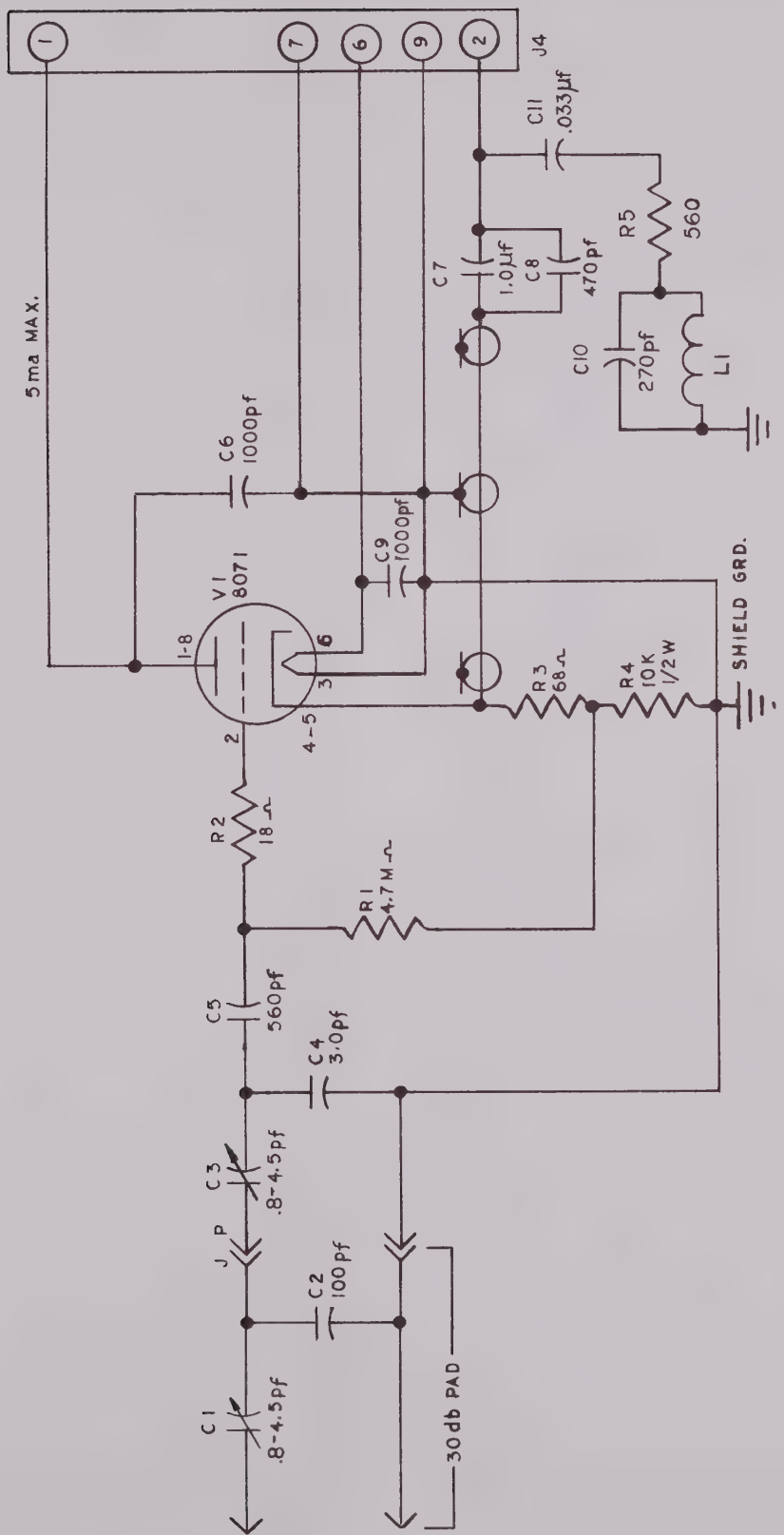

Figure 4-3. Model 126B/PA Schematic Diagram

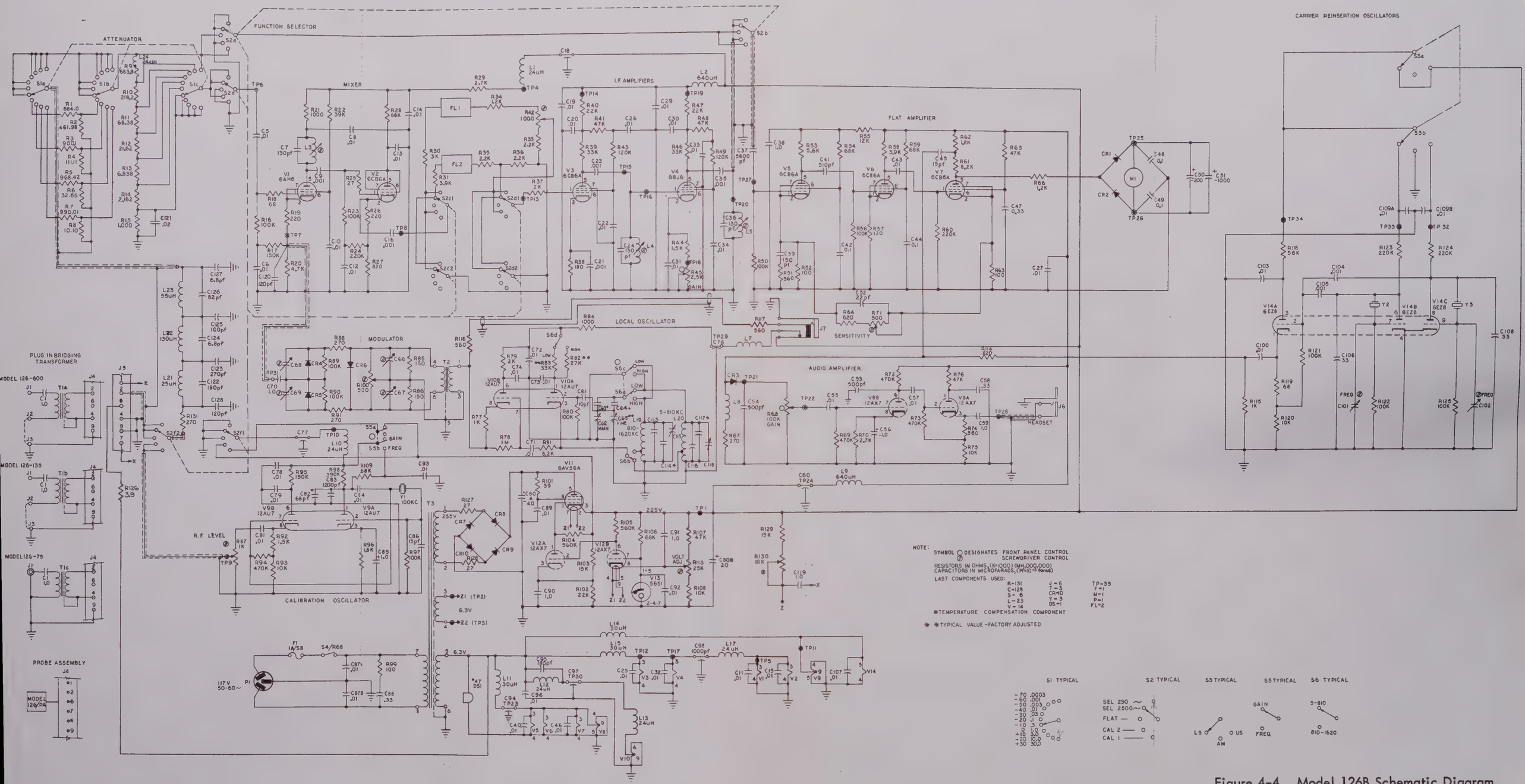

Figure 4-4. Model 126B Schematic Diagram

SECTION V

REPLACEABLE PARTS LIST

PARTS REPLACEMENT

Standard components have been used in this instrument whenever possible. Both standard and special components may be ordered direct from the factory.

When ordering parts always include:

1. Sierra Stock Number.
2. Circuit Reference and Commercial Description.
3. Name, Model and Serial Number of the Instrument.

Parts for this instrument, or further service information may be obtained from:

SIERRA ELECTRONIC DIVISION
Philco Corporation
3885 Bohannon Drive
Menlo Park, California 94025

Telephone (415) 322-7222
TWX 910-373-1282

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
C1	CAPACITOR, 1 mf, 400 VDCW, 20%, Paper PC	902420105	Reliable	RC220B	2
C2	Not Used				
C3	Not Used				
C4	Not Used				
C5	CAPACITOR, .01 mf, 150 VDCW Disc Ceramic	901440103	Centralab	DDM-103	12
C6	Same as C5				
C7	CAPACITOR, 130 pf, 500 VDCW, ±2% Silver Mica	902070131	Elmenco	CM-15E-131	3
C8	CAPACITOR, .01 mf, 600 VDCW Disc Ceramic	901420103	Centralab	DD6-103	30
C9	CAPACITOR, .001 mf, 500 VDCW Disc Ceramic	901400102	Erie	801-.001	7
C10	Same as C8				
C11	Same as C5				
C12	Same as C8				
C13	Same as C8				
C14	Same as C8				
C15	Same as C5				
C16	Same as C9				
C17	Not Used				
C18	CAPACITOR, 1000 pf, 500 VDCW, Ceramic Feed Thru	902630102	Erie	327-102	7
C19	Same as C8				
C20	Same as C8				
C21	Same as C9				
C22	Same as C8				
C23	Same as C9				
C24	Same as C7				
C25	Same as C5				
C26	Same as C8				
C27	Same as C8				
C28	Not Used				
C29	Same as C8				
C30	Same as C8				
C31	Same as C5				
C32	Same as C5				
C33	Same as C8				
C34	Same as C8				
C35	Same as C9				
C36	Same as C7				
C37	CAPACITOR, 5600 pf, 600 VDCW, ±10%, Paper Mylar Side Lead	901100562	Cornell-Dublier	DPMS6D56	1
C38	Same as C1				
C39	CAPACITOR, 1000pf, 500 VDCW, ±5% Durmica	901910102	Elmenco	DM-19-102J	1
C40	Same as C5				
C41	CAPACITOR, 510 pf, 300 VDCW, ±2% Silver Mica	902070511	Elmenco	CM-15E-511G	1
C42	CAPACITOR, .1 mf, 400 VDCW, Paper	901050104	Sprague	4SE-P10	4
C43	Same as C8				
C44	Same as C42				
C45	CAPACITOR, 15 pf, ±5% Silver Mica	902010150	Elmenco	CM-15E-150J	1
C46	Same as C5				
C47	CAPACITOR, .33 mf, 400 VDCW, Paper Tubular	901010334	Sprague	4SE-P33	2
C48	Same as C42				
C49	Same as C42				
C50	CAPACITOR, 200 mf, 6 VDCW Electrolytic	902210207	Sprague	VL-1108	1
C51	CAPACITOR, 1000 mf, 6 VDCW, Electrolytic, 85°C	902230108	Pyramid	TD-1000-6	1
C52	CAPACITOR, 62pf, 500 VDCW, ±2%, Silver Mica	901900620	Elmenco	CM-15C-620	1
C53	CAPACITOR, 500 pf, ±2%, Disc Ceramic, 1000 VDCW	901410501	Centralab	DD501	2

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
C54	Same as C53				
C55	Same as C5				
C56	CAPACITOR, 1.0 mf, 50 VDCW, Electrolytic	902220105	Sprague	VL-1300	1
C57	Same as C8				
C58	Same as C47				
C59	CAPACITOR, 1.0 mf, 200 VDCW, Metalized Paper	902410105	Cornell-Dubiler	MPX2W1	4
C60	Same as C18				
C61	CAPACITOR, 10 pf, ±2%, NPO, Tubular Hi Kap	901420100	Centralab	TCZ-10	1
C62	CAPACITOR, Variable	902801750	Radio Condenser	A02051400	1
C63	CAPACITOR, 750 pf, ±2% at 25°C N750 Ceramic CC45	901410751	Sierra	SS-16235-1	2
C64	Same as C63				
C65	CAPACITOR, Factory Adjusted		Sierra		1
C66	CAPACITOR, 6-14 pf, NPO, Glass Trimmer	903000120	JFD Electronics	VC-11G	4
C67	Same as C66				
C68	Same as C66				
C69	Same as C66				
C70	Same as C59				
C71	Same as C8				
C72	Same as C8				
C73	Same as C8				
C74	Same as C8				
C75	CAPACITOR, 470 pf, ±2%, Silver Mica	902070471	Elmenco	CM-15E-471	1
C76	Same as C18				
C77	Same as C18				
C78	Same as C8				
C79	Same as C8				
C80	CAPACITOR, 40-20 mf, 450 VDCW Electrolytic	902210402	Sierra	SS-17672-1	1
C81	Same as C5				
C82	CAPACITOR, 68 pf, 1200 VDCW, ±2%, Coeff. N330	901410680	Centralab	TCA68	1
C83	CAPACITOR, 1200 pf, 500 VDCW, ±2%, Silver Mica	902070122	Elmenco	CM-19E-122	1
C84	Same as C8				
C85	CAPACITOR, 1.0 mf, 50 VDCW, Electrolytic	902220105	Sprague	VL-1300	1
C86	CAPACITOR, 15 pf, 500 VDCW, ±2%, Silver Mica	902070150	Elmenco	CM-15E-150G	1
C87	CAPACITOR, 2X.01 mf, 500 VDCW, Ceramic Disc	901450103	Centralab	DD3-103	2
C88	CAPACITOR, .33 mf, 400 VDCW, Metalized Paper	902410334	Cornell-Dubiler	MPX4P33	1
C89	Same as C8				
C90	Same as C59				
C91	Same as C59				
C92	Same as C8				
C93	Same as C8				
C94	Same as C18				
C95	CAPACITOR, 180 pf, 500 VDCW, ±2%, Silver Mica	902070181	Erie	CM-15E-181	1
C96	Same as C8				
C97	Same as C18				
C98	Same as C18				
C99	Not Used				
C100	Same as C5				
C101	CAPACITOR, 4.5 - 25 pf	903200250	Erie	TS2A-NPO	1
C102	Same as C101				

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
C103	Same as C8				
C104	Same as C9				
C105	Same as C9				
C106	CAPACITOR, 33 pf, 500 VDCW, ±2%, Silver Mica	902070330	Elmenco	CM-15E-330	2
C107	Same as C8				
C108	Same as C106				
C109	Same as C87				
C110	Not Used				
C111	Not Used				
C112	Not Used				
C113	CAPACITOR, 130 pf, ±2%, NPO Ceramic	901400131	Centralab	TCZ-130	1
C114	CAPACITOR, 62 pf, N330 Ceramic	901440620	Centralab	A02084900	1
C115	CAPACITOR, 1-12 pf, NPO, Glass Trimmer	903000112	JFD	58G	1
C116	CAPACITOR, 47 pf NPO Ceramic	901410470	Centralab	TCZ47	1
C117	Same as C82				
C118	Same as C115				
C119	CAPACITOR, 1.0 mf, 400 VDCW, ±5%, Encapsulated	902430105	Texas Capacitor	Type 31 FW	1
C120	CAPACITOR, 120 pf, ±2%, 500VDCW	902070121	Elmenco	CM-15E-121G	2
C121	CAPACITOR, .02 mf, ±15%, 1000VDCW, Ceramic	901430203	Sprague	10T5-S20	1
C122	Same as C95				
C123	CAPACITOR, 270 pf, 2%, 500V, Silver Mica	902070271	Elmenco	CM-15E271G	1
C124	CAPACITOR, 6.8 pf, 2%, NPO Ceramic	901400068	Centralab	TC-26R8	2
C125	CAPACITOR, 100 pf, 5%, 500V, Silver Mica	902010101	Elmenco	CM-15E-101	1
C126	CAPACITOR, 82 pf, 2%, 500V, Silver Mica	902050820	Elmenco	CM-15E-820G	1
C127	Same as C124				
C128	Same as C120				
CR1	DIODE, Silicon, (Per Specification)	910500041	Hughes	HD5000	2
CR2	Same as CR1				
CR3	DIODE, 1N34A, Germanium	910500034	GE	1N34A	2
CR4	DIODE, Germanium	910500028	Hughes	1812	2
CR5	Same as CR4				
CR6	Same as CR3				
CR7	RECTIFIER, 600 PIV, 750 ma	910800008	Diode Inc.	DI 56	4
CR8	Same as CR7				
CR9	Same as CR7				
CR10	Same as CR7				
DS1	PILOT LIGHT, Bayonet Base	913800001	National Union	No. 47	1
F1	FUSE, 1.0 Amp. Slo-Blo	913200013	Littlefuse	3130001	1
FL1	CRYSTAL FILTER, 2.215 mc, 250 Cycle Bandpass	910100004	Sierra	SS-14485-1	1
FL2	CRYSTAL FILTER, 2.215 mc, 2800 Cycle Bandpass	910100005	Sierra	SS-14486-1	1
J1	Part of Plug-In Unit				
J2	Part of Plug-In Unit				
J3	Part of Plug-In Unit				
J4	Part of Plug-In Unit				

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
J5	PLUG, Male, Min. Rac 17	914900004	Amphenol	17-21090	1
J6	JACK, Telephone	914400014	Switchcraft	13E-JAX	2
J7	Same as J6				
L1	INDUCTOR, 24 mh, 300 ma	909000097	Miller	4626	5
L2	INDUCTOR, 640 Microhenries	044931000	Sierra	SS-4493-1	3
L3	INDUCTOR, 30-38 Microhenries, Variable	127561000	Sierra	SS-12756-1	3
L4	Same as L3				
L5	Same as L3				
L6	Not Used				
L7	Same as L2				
L8	INDUCTOR, 100 Microhenries	909000103	J. Millen	J-300-100	1
L9	Same as L2				
L10	Same as L1				
L11	INDUCTOR, 30 Microhenries, 1.5 Amp	127971000	Sierra	SS-12797-1	1
L12	Same as L1				
L13	Same as L1				
L14	Same as L11				
L15	Same as L11				
L16	Not Used				
L17	Same as L1				
L18	Not Used				
L19	INDUCTOR, Variable	A02057400	Sierra		1
L20	INDUCTOR, Variable	A02057500	Sierra		1
L21	INDUCTOR, 18-32 µh, Variable	A02057100	Sierra		1
L22	INDUCTOR, 110-170 µh, Variable	A02057200	Sierra		1
L23	INDUCTOR, 40-70 µh, Variable	A02057300	Sierra		1
L24	INDUCTOR, 24 µh	909000121	Delevan	1537-46	1
M1	METER, 0-1.0 ma dc, Scale Per Specification	911800045	Sierra	SS-14218-1	1
P1	POWER CORD	916400002			1
R1	RESISTOR, 684.0 ohm, ±1%, 1/2W Dep. Carbon	907400098	Electra	DC-1/2C	1
R2	RESISTOR, 461.98 ohm, ±1%, 1/2W Dep. Carbon	907400099	Electra	DC-1/2C	1
R3	RESISTOR, 900.1 ohm, ±1%, 1/2W Dep. Carbon	907400095	Electra	DC-1/2C	1
R4	RESISTOR, 111.11 ohm, ±1%, 1/2W Dep. Carbon	907400097	Electra	DC-1/2C	1
R5	RESISTOR, 968.42 ohm, ±1%, 1/2W Dep. Carbon	907400094	Electra	DC-1/2C	1
R6	RESISTOR, 32.65 ohm, ±1%, 1/2W Dep. Carbon	907400103	Electra	DC-1/2C	1
R7	RESISTOR, 990.01 ohm, ±1%, 1/2W Dep. Carbon	907400093	Electra	DC-1/2C	1
R8	RESISTOR, 10.10 ohm, ±1%, 1/2W Dep. Carbon	907400100	Electra	DC-1/2C	1
R9	RESISTOR, 683.8 ohm, ±1%, 1/2W Dep. Carbon	907400022	Electra	DC-1/2C	1
R10	RESISTOR, 216.2 ohm, ±1%, 1/2W Dep. Carbon	907400020	Electra	DC-1/2C	1
R11	RESISTOR, 68.38 ohm, ±1%, 1/2W Dep. Carbon	907400018	Electra	DC-1/2C	1
R12	RESISTOR, 21.62 ohm, ±1%, 1/2W Dep. Carbon	907400017	Electra	DC-1/2C	1
R13	RESISTOR, 6.838 ohm, ±1%, 1/2W Dep. Carbon	907400089	Electra	DC-1/2C	1
R14	RESISTOR, 2.162 ohm, ±1%, 1/2W Dep. Carbon	907400090	Electra	DC-1/2C	1
R15	RESISTOR, 1.000 ohm, ±1%, 1/2W Dep. Carbon	907400091	Electra	DC-1/2C	1

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
R16	RESISTOR, 100,000 ohm, ±10%, 1/2W Fixed Comp.	905200104	Allen Bradley	Type EB	6
R17	RESISTOR, 150,000 ohm, ±10%, 1/2W Fixed Comp.	905200154	Allen Bradley	Type EB	1
R18	RESISTOR, 68 ohm, ±10%, 1/2W Fixed Comp.	905200680	Allen Bradley	Type EB	1
R19	RESISTOR, 220 ohm, ±5%, 1/2W Fixed Comp.	905000221	Allen Bradley	Type EB	2
R20	RESISTOR, 4,700 ohm, ±5%, 1/2W Fixed Comp.	905000427	Allen Bradley	Type EB	1
R21	RESISTOR, 1,000 ohm, ±5%, 1/2W Fixed Comp.	905000102	Allen Bradley	Type EB	4
R22	RESISTOR, 39,000 ohm, ±5%, 1/2W Fixed Comp.	905000393	Allen Bradley	Type EB	1
R23	Same as R16				
R24	RESISTOR, 220,000 ohm, ±10%, 1/2W Fixed Comp.	905200224	Allen Bradley	Type EB	2
R25	RESISTOR, 27 ohm, ±10%, 1/2W Fixed Comp.	905200270	Allen Bradley	Type EB	1
R26	Same as R19				
R27	RESISTOR, 820 ohm, ±5%, 1/2W Fixed Comp.	905000821	Allen Bradley	Type EB	3
R28	RESISTOR, 68,000 ohm, ±5%, 1/2W Fixed Comp.	905000683	Allen Bradley	Type EB	2
R29	RESISTOR, 2,700 ohm, ±5%, 1/2W Fixed Comp.	905000272	Allen Bradley	Type EB	2
R30	RESISTOR, 3,000 ohm, ±5%, 1/2W Fixed Comp.	905000302	Allen Bradley	Type EB	1
R31	RESISTOR, 3,900 ohm, ±5%, 1/2W Fixed Comp.	905000392	Allen Bradley	Type EB	1
R32	Not Used				
R33	RESISTOR, 2,200 ohm, ±5%, 1/2W Fixed Comp.	905000222	Allen Bradley	Type EB	3
R34	RESISTOR, 1,200 ohm, ±5%, 1/2W Fixed Comp.	905000122	Allen Bradley	Type EB	1
R35	Same as R33				
R36	Same as R33				
R37	RESISTOR, 2,000 ohm, ±5%, 1/2W Fixed Comp.	905000202	Allen Bradley	Type EB	2
R38	RESISTOR, 180 ohm, ±5%, 1/2W Fixed Comp.	905000181	Allen Bradley	Type EB	1
R39	RESISTOR,33,000 ohm, ±10%, 1/2W Fixed Comp.	905200333	Allen Bradley	Type EB	1
R40	RESISTOR, 22,000 ohm, ±10%, 1/2W Fixed Comp.	905200223	Allen Bradley	Type EB	2
R41	RESISTOR, 47,000 ohm, ±10%, 1/2W Fixed Comp.	905200473	Allen Bradley	Type EB	4
R42	POTENTIOMETER, 1000 ohm, Type UPE-70	907900105	CTS	32275	2
R43	RESISTOR, 120,000 ohm, ±10%, 1/2W Fixed Comp.	905200124	Allen Bradley	Type EB	2
R44	Same as R27				
R45	POTENTIOMETER, 2,500 ohm, 2W Composition	907900152	CTS	Ser.#HT321 Spec.#35774	1
R46	RESISTOR, 33,000 ohm, ±5%, 1/2W Fixed Comp.	905000333	Allen Bradley	Type EB	1
R47	Same as R40				
R48	Same as R41				
R49	Same as R43				
R50	Same as R16				
R51	RESISTOR, 560 ohm, ±5%, 1/2W Fixed Comp.	905000560	Allen Bradley	Type EB	1
R52	RESISTOR, 100 ohm, ±5%, 1/2W Fixed Comp.	905000101	Allen Bradley	Type EB	2
R53	RESISTOR, 5,600 ohm, ±10%, 1/2W Fixed Comp.	905200562	Allen Bradley	Type EB	1
R54	RESISTOR, 68,000 ohm, ±10%, 1/2W Fixed Comp.	905200683	Allen Bradley	Type EB	2
R55	RESISTOR, 12,000 ohm, ±10%, 1/2W Fixed Comp.	905200123	Allen Bradley	Type EB	1
R56	Same as R16				
R57	RESISTOR, 120 ohm, ±5%, 1/2W Fixed Comp.	905000121	Allen Bradley	Type EB	1
R58	RESISTOR, 3,900 ohm, ±10%, 1 W Fixed Comp.	905600392	Allen Bradley	Type EB	1
R59	Same as R54				
R60	Same as R24				
R61	RESISTOR, 8,200 ohm, ±5%, 1 W Fixed Comp.	905400822	Allen Bradley	Type EB	1
R62	RESISTOR, 1,800 ohm, ±5%, 1/2W Fixed Comp.	905000182	Allen Bradley	Type EB	2
R63	Same as R52				

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
R64	RESISTOR, 620 ohm, ±5%, 1/2W Fixed Comp.	905000621	Allen Bradley	Type EB	1
R65	Same as R41				
R66	RESISTOR, 1,200 ohm, ±10%, 1/2W Fixed Comp.	905200122	Allen Bradley	Type EB	1
R67	RESISTOR, 270 ohm, ±10%, 1/2W Fixed Comp.	905200271	Allen Bradley	Type EB	1
R68	POTENTIOMETER, 100,000 ohm, 2W Comp. Switch Section	907900071	Sierra	SS-393-3-45	1
R69	RESISTOR, 470,000 ohm, ±10%, 1/2W Fixed Comp.	905200474	Allen Bradley	Type EB	4
R70	Same as R29				
R71	POTENTIOMETER, 500 ohm, 1/2W Taper 1, Comp.	907900100	Stackpole	LH61	1
R72	Same as R69				
R73	Same as R69				
R74	RESISTOR, 560 ohm, ±5%, 1/2W Fixed Comp.	905000561	Allen Bradley	Type EB	3
R75	RESISTOR, 10,000 ohm, ±10%, 1/2W Fixed Comp.	905200103	Allen Bradley	Type EB	2
R76	Same as R41				
R77	Same as R21				
R78	RESISTOR, 1 Meg. Ohm, ±10%, 1/2W Fixed Comp.	905200105	Allen Bradley	Type EB	1
R79	Same as R37				
R80	Same as R16				
R81	RESISTOR, 8,200 ohm, ±5%, 1/2W Fixed Comp.	905000822	Allen Bradley	Type EB	1
R82	RESISTOR, 22K, ±5%, 1/2W Fixed Comp.	905000223	Allen Bradley	Type EB	1
R83	Same as R82				
R84	Same as R21				
R85	RESISTOR, 150 ohm, ±5%, 1/2W Fixed Comp.	905000151	Allen Bradley	Type EB	2
R86	Same as R85				
R87	Same as R42				
R88	RESISTOR, 270 ohm, ±5%, 1/2W Fixed Comp.	905000271	Allen Bradley	Type EB	3
R89	RESISTOR, 100,000 ohm, ±5%, 1/2W Fixed Comp.	905000104	Allen Bradley	Type EB	5
R90	Same as R89				
R91	Same as R88				
R92	RESISTOR, 1,500 ohm, ±5%, 1/2W Fixed Comp.	905000152	Allen Bradley	Type EB	1
R93	Same as R75				
R94	Same as R69				
R95	RESISTOR, 150,000 ohm, ±5%, 1/2W Fixed Comp.	905000154	Allen Bradley	Type EB	1
R96	Same as R62				
R97	Same as R16				
R98	RESISTOR, 390,000 ohm, ±5%, 1/2W Fixed Comp.	905000394	Allen Bradley	Type EB	1
R99	RESISTOR, 100 ohm, ±10%, 1/2W Fixed Comp.	905200101	Allen Bradley	Type EB	1
R100	POTENTIOMETER, 500 ohm, 1/4 Composition (Lug Terminals)	907900102	Allen Bradley	Type R	1
R101	RESISTOR, 39 ohm, ±10%, 1/2W Fixed Comp.	905200390	Allen Bradley	Type EB	1
R102	RESISTOR, 22,000 ohm, ±5%, 2W Fixed Comp.	905800223	Allen Bradley	Type EB	1
R103	RESISTOR, 15,000 ohm, ±5%, 2W Fixed Comp.	905800153	Allen Bradley	Type HB	1
R104	RESISTOR, 560,000 ohm, ±5%, 1/2W Fixed Comp.	905000564	Allen Bradley	Type EB	2
R105	Same as R104				
R106	RESISTOR, 68,000 ohm, ±5%, 1W Fixed Comp.	905400683	Allen Bradley	Type GB	1
R107	RESISTOR, 47,000 ohm, ±5%, 1W Fixed Comp.	905400473	Allen Bradley	Type GB	1
R108	RESISTOR, 10,000 ohm, ±5%, 1/2W Fixed Comp.	905000103	Allen Bradley	Type EB	2
R109	Same as R28				
R110	Not Used				
R111	Not Used				
R112	Not Used				

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
R113	POTENTIOMETER, 25,000 ohm, Printed Circuit Type, Taper 1	907900103	Stackpole	LH61	1
R114	Same as R27				
R115	Same as R21				
R116	Same as R74				
R117	Same as R74				
R118	RESISTOR, 56K, ±5%, 1/2W Fixed Comp.	905000563	Allen Bradley	Type EB	1
R119	RESISTOR, 68 ohm, ±5%, 1/2W Fixed Comp.	905000680	Allen Bradley	Type EB	1
R120	Same as R108				
R121	Same as R89				
R122	Same as R89				
R123	RESISTOR, 220,000 ohm, ±5%, 1/2W Fixed Comp.	905000224	Allen Bradley	Type EB	2
R124	Same as R123				
R125	Same as R89				
R126	RESISTOR, 3.9 ohm, ±5%, 1/2W Fixed Comp.	905000039	Allen Bradley	Type EB	1
R127	RESISTOR, 27 ohm, ±5%, 1W Fixed Comp.	905000270	Allen Bradley	Type GB	2
R128	Same as R127				
R129	RESISTOR, 15 KΩ, ±5%, 0.5W Fixed Comp.	905000153	Allen Bradley	Type EB	1
R130	POTENTIOMETER, 10 K Ohm, ±10%, Linear	907900127	CTC	#34133	1
R131	Same as R88				
S1	SWITCH, Selector, 3 Pole, 11 Position, 4 Section	911200056	Sierra	SS-14205-1	1
S2	SWITCH, Selector, 9 Pole, 5 Position, 6 Section	911200046	Sierra	SS-12455-1	1
S3	SWITCH, Selector, 2 Pole, 3 Position, 1 Section	911200058	Sierra	SS-14206-1	1
S4	SWITCH, On-Off, (Part of R68 Potentiometer)	907900071	Sierra	SS-393-3-45	1
S5	SWITCH, Selector, 2 Pole, 2 Position, 2 Section	911200086	Sierra	SS-15752-1	1
S6	SWITCH, Selector, 4 Pole, 2 Position, 2 Section	911200108	Sierra	A02058600	1
T1 A	Part of Plug-In Unit				1
T1 B	Part of Plug-In Unit				1
T1 C	Part of Plug-In Unit				1
T2	TRANSFORMER, 2.1 Turns Ratio	141592000	Sierra	SU-14159-2	1
T3	TRANSFORMER, Sec. #1:268 Vrms, at 75 ma: Sec. #2:6.3 Vrms, at 3.5A: Sec. #3.6.3A Primary 117 Vrms 50/60 cps	124031100	Sierra	SS-12403-1A	1
V1	VACUUM TUBE, Sharp Cut-Off Pentode	910700074	Sierra	6AH6	1
V2	VACUUM TUBE, Sharp Cut-Off Pentode	910700059	Sierra	6CB6A	5
V3	Same as V2				
V4	VACUUM TUBE, Sharp Cut-Off Pentode	910700075	Sierra	6BJ6	1
V5	Same as V2				
V6	Same as V2				
V7	Same as V2				

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
V8	VACUUM TUBE, Twin Triode	910700069	Sierra	12AX7	2
V9	VACUUM TUBE, Twin Triode	910700052	Sierra	12AU7	2
V10	Same as V9				
V11	VACUUM TUBE, Pentode	910700076	Sierra	6AV5GA	1
V12	Same as V8				
V13	GAS TUBE, Voltage Reference	910700015	Sierra	5651	1
V14	VACUUM TUBE, Triple Triode	910700088	Sylvania	6EZ8	1
XDS1	PILOT LIGHT, Holder	914200008	Dialco	7-04	1
XF1	FUSE HOLDER	913400001	Littlefuse	342003	1
XV1	TUBE SOCKET, 7 pin minature for printed board	914000036	Methode	P455	8
XV2	Same as XV1				
XV3	Same as XV1				
XV4	Same as XV1				
XV5	Same as XV1				
XV6	Same as XV1				
XV7	Same as XV1				
XV8	TUBE SOCKET, 9 pin Noval for pinted board	914000037	Methode	P465	5
XV9	Same as XV8				
XV10	Same as XV8				
XV11	TUBE SOCKET, Octal for printed board	914000035	Elco	611PH-1/16	1
XV12	Same as XV8				
XV13	Same as XV1				
XV14	Same as XV8				
XY1	CRYSTAL, Holder, Ceramic	914200021	Johnson	126-105	3
XY2	Same as XY1				
XY3	Same as XY1				
Y1	CRYSTAL, Quartz, 100 kc, 0.01%	912200010	Northern Eng.	SS-13198-1	1
Y2	CRYSTAL, Quartz, 2,213.5 kc, .005%	911200011	Northern Eng.	SS-13417-1	1
Y3	CRYSTAL, Quartz, 2,216.5 kc, .005%	911200012	Northern Eng.	SS-13418-1	1

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	MODEL 126-600 Plug-In Unit				
C1	CAPACITOR, 1.0 mf, 400 VDCW,±5% Encapsulated	902420105	Texas Capacitor	1017	1
J1	BINDING POST, Insulated	915200003	General Radio	938-C	2
J2	Same as J1				
J3	BINDING POST, Grounding	915200004	General Radio	938-WB	1
J4	PLUG, Min-Rac Type 17, 5 Contacts	914600004	Amphenol	17-21090	1
T1A	TRANSFORMER, 600 Ohm	147821000	Sierra	SP-14782-1	1
	MODEL 126-135 Plug-In Unit				
C1	CAPACITOR, 1.0 mf, 400 VDCW,±5% Encapsulated	902420105	Texas Capacitor	1017	1
J1	BINDING POST, Insulated	915200003	General Radio	938-C	2
J2	Same as J1				
J3	BINDING POST, Grounding	915200004	General Radio	938-WB	1
J4	PLUG, Min-Rac Type 17, 5 Contacts	914600004	Amphenol	17-21090	1
T1B	TRANSFORMER, 135 Ohm	147811000	Sierra	SP-14781-1	1
	MODEL 126-75 Plug-In Unit				
C1	CAPACITOR, 1.0 mf, 400 VDCW,±5% Encapsulated	902420105	Texas Capacitor	1017	1
J1	JACK, Panel, BNC	914800043	Amphenol	UG657/U	1
J2	Not Used				
J3	Not Used				
J4	PLUG, Min-Rac Type 17, 5 Contacts	914600004	Amphenol	17-21090	1
T1C	TRANSFORMER, 75 Ohm	147801000	Sierra	SP-14780-1	1

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
	MODEL 126B/PA Probe Assembly				
C1	CAPACITOR, Variable, .8-4.5 pF, Glass Piston	903000845	JFD	VC-21G	2
C2	CAPACITOR, Fixed, 100 pF, ±1%, Mica Disc	901800017	Sangamo	M55	1
C3	Same as C1				
C4	CAPACITOR, Fixed, 3.0 pF, Dur-Mica, 500 VDCW	901900030	Elmenco	DM-15-030K	1
C5	CAPACITOR, Fixed, 560 pF, 200 VDCW, 10% Ceramic	901300561	Vitramon	VK20CW561K	1
C6	CAPACITOR, Fixed, 1000 pF, 200VDCW, 10% Ceramic	901300102	Vitramon	VK20CW102K	2
C7	CAPACITOR, Fixed, 1.0 MF, 400 VDCW, ±5%	902420105	Texas Capacitor	1017	1
C8	CAPACITOR, Fixed, 470 pF, ±2%, Silver Mica	902070471	Elmenco	CM-15E-471	1
C9	Same as C6				
C10	CAPACITOR, Fixed, 270 pf, Silver Mica	902010271	Elmenco	CM-15E-241J	1
C11	CAPACITOR, Fixed, .033 mfd	901100333	CD	DPMS4S33	1
J1	Not Used				
J2	Not Used				
J3	Not Used				
J4	PLUG, Min-Rac, Type 17, 5 Contacts	914600004	Amphenol	17-21090	1
L1	INDUCTOR, Fixed, 44 Microhenry	A02057000	Sierra		1
R1	RESISTOR, Fixed, 4.7MΩ, ±5%, 0.25W	906900475	Allen-Bradley	Type CR	1
R2	RESISTOR, Fixed, 18Ω ±5%, 0.25W	906900180	Allen-Bradley	Type CR	1
R3	RESISTOR, Fixed 68Ω ±5%, 0.25W	906900680	Allen-Bradley	Type CR	1
R4	RESISTOR, Fixed, 10,000Ω ±5%, 0.50W	905000103	Allen-Bradley	Type EB	1
R5	RESISTOR, Fixed, 560Ω ±5%, 0.50W	905000561	Allen-Bradley	Type EB	1
V1	ELECTRON TUBE, Subminiature Triode	910700097	Sylvania	8071	1
XV1	SOCKET, 8 Pin	914000012	Cinch	142-13686	1

INSTRUCTION MANUAL

UNIVERSAL SPEAKER KIT

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072265

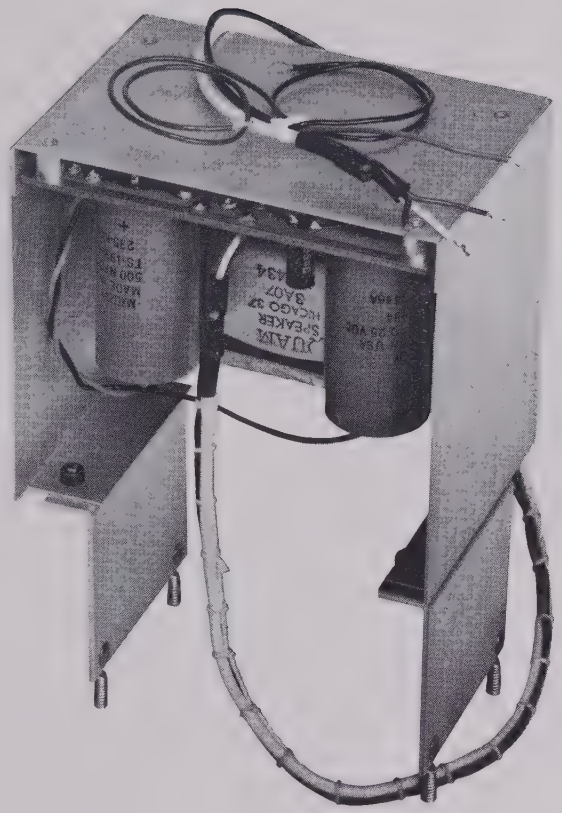

Figure 1. Speaker Assembly with Model 125/126 Brackets

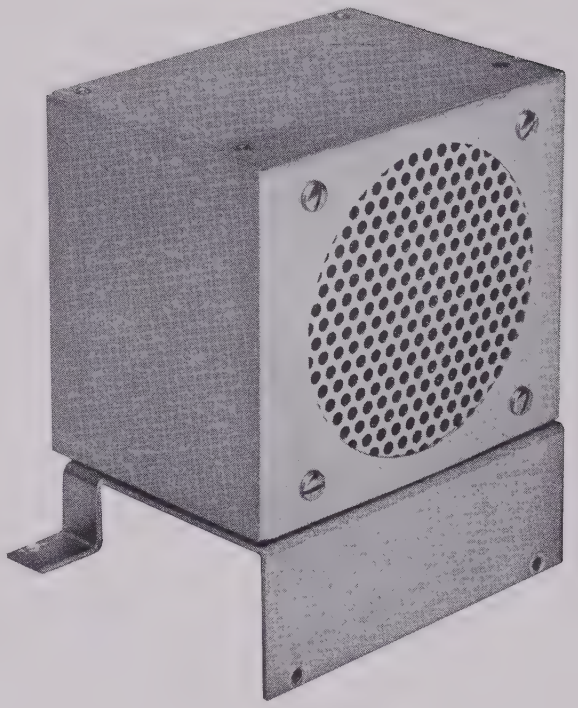

Figure 2. Speaker Assembly with Model 128 Brackets

UNIVERSAL SPEAKER KIT

DESCRIPTION

The Sierra Universal Speaker Kit is made for use with all series and versions of the Sierra Models 125, 126 and 128 Frequency Selective Voltmeters. Installation of the Kit provides loud speaker monitoring of the audio modulation on the carrier signal being measured.

The Kit is made up of an audio amplifier and speaker mounted in a speaker case, a connecting cable and panel jack, and the required mounting brackets and hardware.

The three transistor amplifier, consisting of a driver stage and push-pull output stage, furnishes sufficient power to provide adequate speaker volume. Output level to either the speaker or headphones is controlled by the Voltmeter Audio Gain control. Power for the amplifier is taken from the Voltmeter, either through a dropping resistor from the power supply of the Model 128, or through a voltage doubling rectifier from the filament supply of the Model 125 or 126. The rectifier and dropping resistor are mounted on the speaker audio circuit board. The jack furnished with the kit, when installed to replace the Phones jack originally in the Voltmeter, switches off the speaker whenever headphones are plugged into the Voltmeter Phones jack.

SPECIFICATIONS

FREQUENCY RANGE	300 cps to 5 kc
Installed In Voltmeter	300 cps to 2.5 kc
FREQUENCY RESPONSE	±1 db
INPUT	2 volts p-p maximum
OUTPUT	0.25 watts undistorted
POWER REQUIREMENTS	
From Models 125, 126	6.3 volts AC, 120 ma, 50-1000 cps
From Model 128	-24 volts DC, 45 ma

SPECIFICATIONS (continued)

DIMENSIONS (without brackets)	
Height	3-5/8 inches
Width	4 inches
Depth	2-7/8 inches
WEIGHT (without brackets)	14 ounces
SIERRA PART NO.	B02074000

INSTALLATION PROCEDURE

1. Solder VIOLET wire to proper terminal on Speaker Kit circuit board.

   For Models 125 and 126 - to terminal marked 6.3 vac.(Figure 5).
   For Model 128 - to terminal marked -24 vdc. (Figure 6).

2. Drill holes in chassis as required:

   For Models 125 and 126, see Figure 3.
   For Model 128, see Figure 4.

   Later production runs of all models will have the holes pre-punched in the chassis.

3. Select brackets required and attach to speaker case:

   For Models 125 and 126, see Figure 1.
   For Model 128, see Figure 2.

4. Fasten speaker case to chassis by means of brackets.

   For Models 125 and 126, use number 6 Kep nuts on spade lugs.
   For Model 128, use number 4 machine screws and Kep nuts.

   (In the -Y version of the Model 125, the "existing holes", Figure 3, are used to attach an under-chassis shield bracket. The screws in these holes are to be removed. The spade lugs on the speaker brackets replace them to hold both the speaker case and the under-chassis shield bracket.)

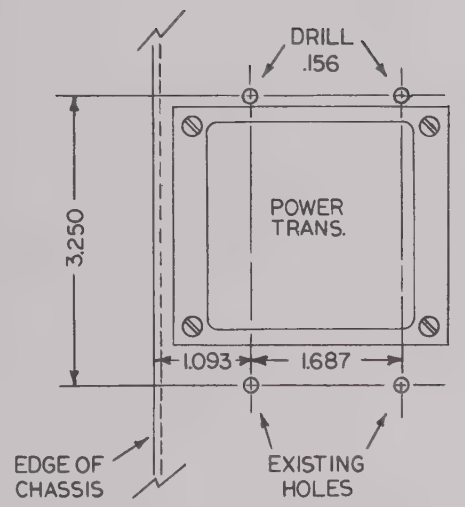

Figure 3. Mounting Hole Localtion Model 125/126

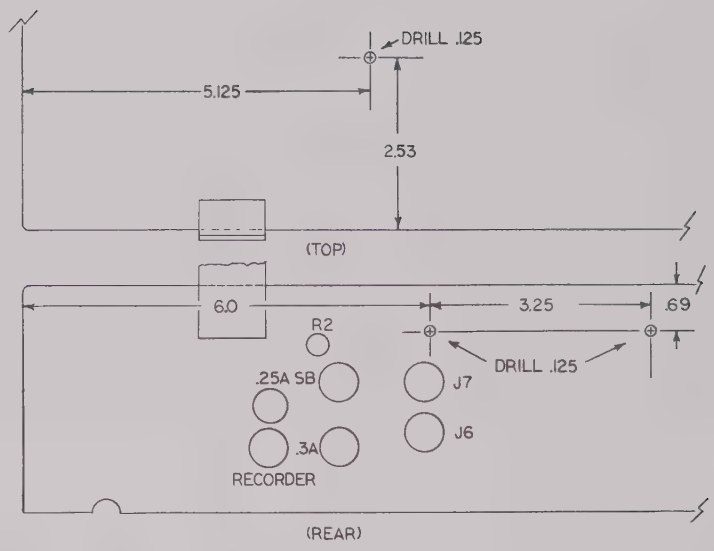

Figure 4. Mounting Hole Location Model 128

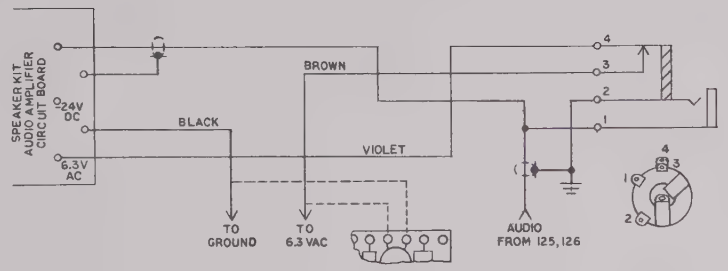

Figure 5. Wiring Diagram Model 125/126

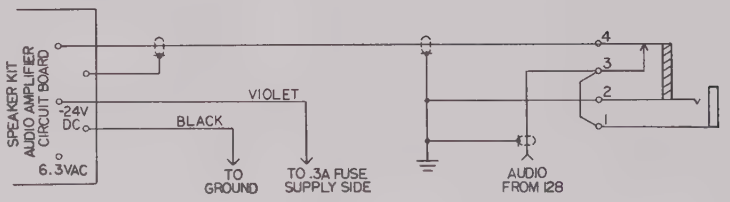

Figure 6. Wiring Diagram Model 128

5. Run Speaker Kit cable into bottom of chassis.

In Models 125 and 126, lay cable in front of Mixer module cover and run down through space between RF tuning casting and chassis. Secure cable to projecting meter stud with plastic cable clamp and 6-32 Kep nut.

In Model 128, run cable down through large rubber grommet near center of chassis.

6. Disconnect leads from PHONES jack. Remove old jack and install the jack supplied with the kit. (Later production runs of all models will contain the new type jack as standard equipment.)

7. Reconnect audio leads and connect free end of speaker cable to jack according to wiring diagram. Connect Brown and Black leads to circuit board.

For Models 125 and 126 use Figure 5. Lead length is such that wiring runs are direct.

For Model 128 use Figure 6 and following procedure:

a. Remove shield cover from Audio circuit board of the 128 Voltmeter.

b. Pull the Violet and Black wires out of the cable tie near the free end.

c. Connect the Audio lead from the Model 128 Audio circuit board to jack terminal 1.

d. Run the Audio lead of the speaker cable underneath the Model 128 Audio circuit board and connect to jack terminal 4. Connect shield and ground lead from Audio circuit board to jack terminal 2.

e. Cut off the long free end of the Brown wire. Leave enough to make the jumper connection from terminal 1 to 3 on the jack, as indicated in Figure 6.

f. Cut the Black lead to a convenient length and connect to one of the ground lugs near the power supply circuit board.

g. Connect the free end of the Violet wire to the power supply side of the .3A fuse.

h. Replace cover over Audio circuit board.

UNIVERSAL SPEAKER KIT

LIST OF PARTS IN KIT

1 - Speaker assembly, with speaker and printed circuit board amplifier mounted in the case, and the interconnecting cable attached to the circuit board, except for the Violet wire.

1 - Single circuit jack, with switching contacts.

2 - Speaker mounting brackets with spade lugs attached. (For Models 125 and 126)

1 - Speaker mounting bracket for Model 128.

5 - 6-32 Kep nuts.

7 - 4-40 x 5/16 BHNP machine screws.

3 - 4-40 Kep nuts.

1 - 3/16" plastic cable clamp.

REPLACEABLE PARTS LIST

Schem. Ref. No.	Description	Sierra Stock No.	Mfr.	Dwg. or Mfr. No.	Tot. Quan.
C1	CAPACITOR, 1 μf, 25V	903300105			1
C2	CAPACITOR, 500 μf, 25V	902210507	Mallory	PTC	2
C3	Same as C2				
C4	CAPACITOR, 22 mf, 25V	903300226			1
CR1	DIODE	910500031		1N456	1
CR2	DIODE	910800008		DI 56	2
CR3	Same as CR2				
J1	CONNECTOR, Phone	914400014	Switchcraft	Littel Jak #13E	1
LS1	LOUDSPEAKER	921400002	Quam	3A07	1
Q1	TRANSISTOR, PNP	910300007	G.E.	2N404	1
Q2	TRANSISTOR, NPN	910300033	G.E.	7A31	2
R1	RESISTOR, 33K Ohm ±5% 1/4W	906900333	A.B.	CB	1
R2	RESISTOR, 10K Ohm ±5% 1/4W	906900103	A.B.	CB	1
R3	RESISTOR, 2.2K Ohm ±5% 1/4W	906900222	A.B.	CB	1
R4	RESISTOR, 22K Ohm ±5% 1/4W	906900223	A.B.	CB	2
R5	Same as R4				
R6	RESISTOR, 4.7 Ohm ±10% 1/4W	907100470	A.B.	CB	2
R7	Same as R6				
R8	RESISTOR, 180 Ohm ±5% 1/2W	905000181	A.B.	EB	1
R9	RESISTOR, 3.3K ±5% 1/4W	906900332	A.B.	CB	1
T1	TRANSFORMER, Transistor P-P Input	910000072	UTC	SSO-8	1
T2	TRANSFORMER, Transistor P-P Output	910000074	UTC	0-22	1
	CABLE CLAMP	915300010			1

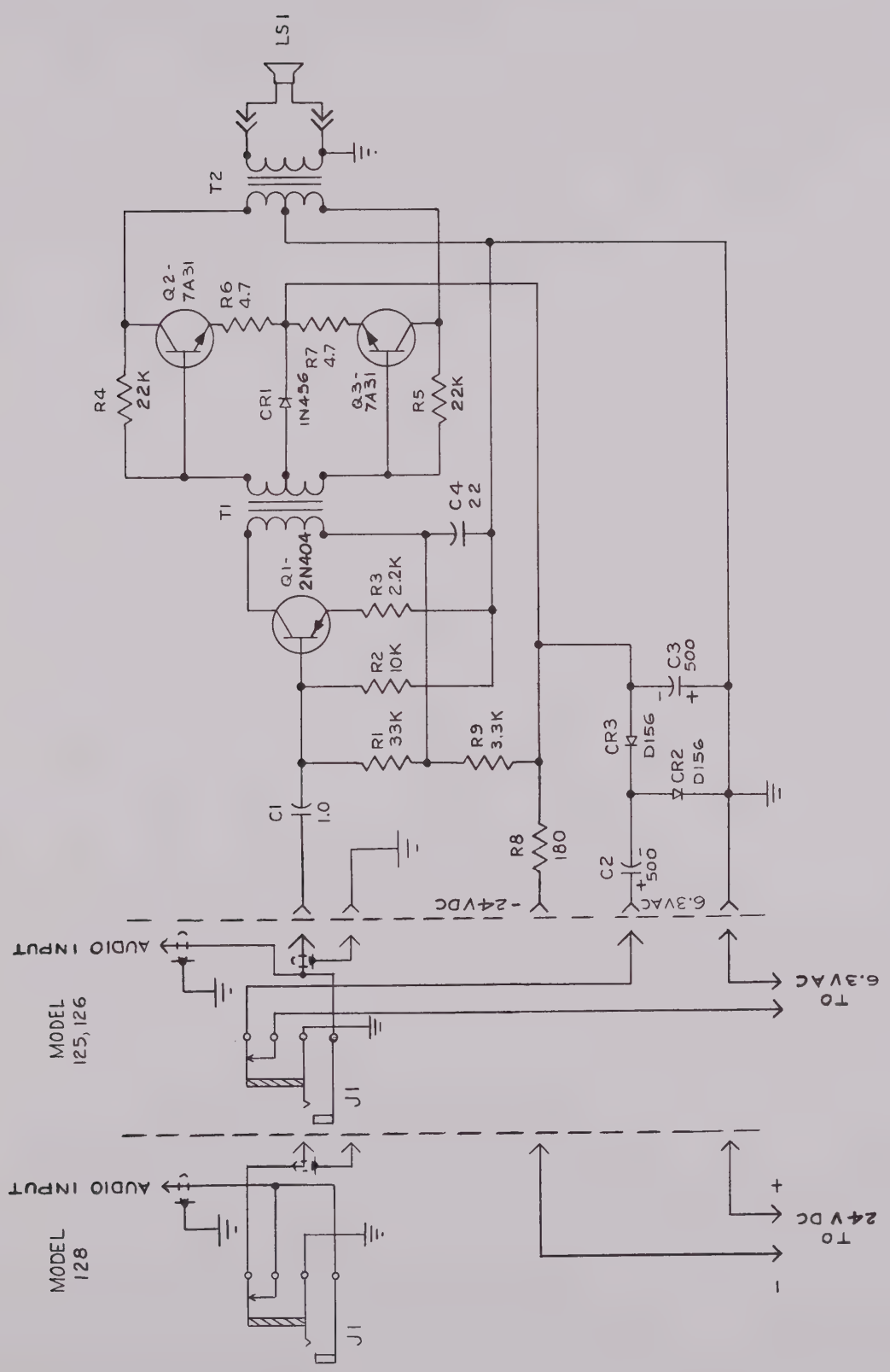

Figure 7. Universal Speaker Kit Schematic Diagram

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